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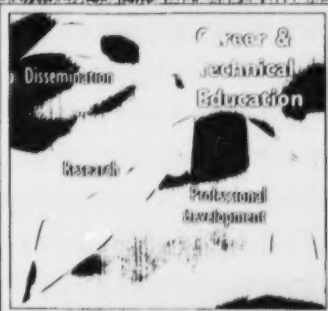
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ABSTRACT

The evolution of tech prep during the late 1990s was examined in a 4-year longitudinal study of 8 selected tech prep consortia since reauthorization of federal tech prep legislation in 1998. Cross-consortium results pertaining to curriculum reform, articulation, academic standards, and other essential elements of tech prep were examined along with factors contributing to changes in those elements over time. Data were collected through field visits in 2000-2001 and personal interviews with a wide range of stakeholders. The following were among the study's nine recommendations for future policy and practice: (1) encourage development of local and state policies promoting articulation agreements supporting transition from high school to college for more students; (2) increase funding for tech prep at the secondary and postsecondary levels and use the additional funds to explore innovative curricular and instructional options serving an increasingly diverse student population; (3) continue to affiliate tech prep

with raised academic standards and enhanced career opportunities; (4) involve four-year colleges and universities in tech prep curriculum reform from the beginning; and (5) continue to utilize concepts associated with tech prep to enhance career and technical education (CTE) but do not confuse tech prep with conceptualizations of CTE that encourage immediate employment after high school. (Contains 41 references, 6 tables, and 1 figure.) (MN)

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**New Lessons about Tech Prep Implementation:
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Federal Tech Prep Legislation in 1998**

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EXECUTIVE SUMMARY

To fully understand the evolution of Tech Prep during the later part of the 1990s, it is helpful to examine how implementation continued since new legislation was passed in 1998–99. This report presents selected results of the most recent data collection associated with a 4-year longitudinal study of Tech Prep implementation and student outcomes, comparing earlier findings (Bragg et al., 1999) to results collected during field visits in 2000 and 2001. Cross-consortium results pertaining to curriculum reform, articulation, academic standards, and other essential elements of Tech Prep are examined, along with factors that contribute to changes in these elements over time. Qualitative findings are based on a systematic analysis of themes and patterns emerging from site visits and personal interviews with a wide range of stakeholders, especially educational administrators, faculty, and students. Recommendations pertaining to future policy and practice conclude the report.

Changes in Tech Prep

Changes in Tech Prep may occur as an outgrowth of reauthorization of the Carl D. Perkins legislation on vocational and technical education or in association with local practice. Legislated changes pertaining to local implementation because of new federal legislation are:

- Perkins III encouraged greater emphasis on changing instructional strategies at both the secondary and postsecondary levels. Contextual learning and work-based learning (WBL) were emphasized at both levels of education.
- Perkins III added language dealing with articulation agreements, specifying 2+2 Tech Prep programs articulated with baccalaureate-degree programs, creating 2+2+2 options. The idea of CTE as a part of a high-school-to-college transition option, preparing students for bachelor's degrees, represented an important departure from prior federal legislation.
- Another change of significance in Perkins III was an increased emphasis on accountability. Ambiguity about whether states should report performance results for Tech Prep was removed when Perkins III specified that state-level reporting would be a requirement, but difficulties existed for federal and state agencies in documenting student participation and measuring impact.

Changes Within Local Consortia:

- Tech Prep has focused largely on secondary curriculum reform during its initiation and early implementation in the 1990s, and a strong emphasis on secondary school reform has continued. Predominant thinking on the local level seems to be that Tech Prep reform needs to occur within high schools to "raise the bar" for students who matriculate into college, usually community college. Theoretically if Tech Prep programs are successful at reaching this goal, more resources and attention need to shift to the postsecondary level.

- Tech Prep has changed to address state efforts to raise academic standards, including requiring more academic course-taking for all students, not only those aspiring to 4-year college. The College Tech Prep model has emerged to address this need, representing a logical outgrowth of the dialogue about Tech Prep's contribution to academic reform.
- A few local consortia pursued High Schools That Work (HSTW) as a means of integrating Tech Prep under a broader umbrella of high school reform. They used Tech Prep to move high schools toward enhanced academic achievement for all students.
- Articulated 2+2 curriculum (and other variations), based on articulation agreements, has been a fundamental building block of Tech Prep from the start, though the extent to which they are fully utilized by students or updated by faculty vary widely. However, new articulation agreements allow dual credit for CTE academic course-taking in association with Tech Prep. Three consortia offered scholarships to Tech Prep students as a means of reinforcing their opportunities to transition to college.
- All consortia continued earlier efforts to establish more 2+2+2 curricular options. These initiatives were usually sought out in a few selected career areas, rather than curriculum-wide. Tech Prep pathways were developed in such areas as allied health, business, and engineering technologies where similar programs existed in 2- and 4-year colleges. These Tech Prep pathways offered students the Applied Associate of Science (AAS) degree leading to an applied or standard Bachelor of Science (BS) degree offered by public or private 4-year colleges.
- New certifications emerged as a mechanism for enhancing curriculum alignment and awarding college credits for coursework during high school. Particularly in the Information Technology (IT) area, several consortia were utilizing certification as "proof" that students had mastered competencies in high school that were at college level.
- Changes in updating, broadening, and integrating CTE curriculum were evident at the secondary level. Specifically, career clusters (referring to groupings of related occupations) and career pathways (extending specific clusters through career ladders linked to further education) were emphasized, and these innovations were endorsed by consortium leaders to insure that secondary schools were preparing students for career opportunities requiring 2 or more years of postsecondary education.
- Career academies were an emerging model of delivery of Tech Prep, and there was a growing commitment to either initiate new career academies or enhance existing ones. Varying widely in approach and structure, consortium leaders displayed a positive attitude toward the career academy concept, and enthusiasm was evident in secondary administrators and teachers implementing them. At the postsecondary level, we observed a companion idea to career academies in learning communities.

Contributors to Change

Contributors to change were categorized according to the schema on educational implementation by Fullan (2001), which identifies characteristics of change, local characteristics, and external factors.

Characteristics of Change:

- Questions were raised from the beginning about key definitions of what a Tech Prep program entails and who the Tech Prep student is. Difficulties in identifying and serving a specific target population, such as the forgotten half or neglected majority, have been observed since Perkins II was passed in 1990, resulting in many consortia emphasizing an all-inclusive target audience.
- Charges that Tech Prep is a new form of tracking have been pervasive, whether tracking takes the form of general education, vocational education, or a hybrid of the two. Understanding the negative stigma of tracking, some teachers, parents, and students have steered away from Tech Prep. Responding to this criticism, Tech Prep consortia expanded policies to be inclusive of diverse student groups, usually calling for *all students* to participate.
- Pervasive issues surrounding the creation and sustenance of articulation agreements and alternative curriculum and instruction were raised relative to Tech Prep. Over time, local consortia made changes to align Tech Prep curriculum with the existing educational system, such as replacing applied academics courses with new contextual teaching methodologies in existing academic courses.

Local Characteristics:

- Curricular changes associated with Tech Prep were not subtle; they required the undivided attention of leaders working in a highly collaborative way. Educational administrators at the secondary and postsecondary level who were most supportive of Tech Prep gained extensive knowledge and exhibited a genuine commitment to seeing that Tech Prep implementation occurred in a productive way over time.
- Skillful leadership was evident in coordinating local consortium efforts, and this was especially true in communities where Tech Prep was perceived as antithetical to academic reform, due partly to the historic split between academic education and vocational education. Capable leaders gained support for core concepts by engaging competent leaders in schools, colleges, businesses, and community groups.
- Turnover and inconsistency in local leadership contributed to difficulties with implementation over time, especially when key leaders were replaced with persons lacking understanding and commitment. Even when new leaders showed strong commitment to Tech Prep, a significant change in direction was evidenced for some initiatives when new people, relationships, and ideas emerged.

- Fiscal resources were too limited to allow consortia to implement changes that local leaders desired. Consistently, we heard complaints from constituents of all types (administrators, teachers, business representatives, parents, students) that too few resources were dedicated to resolving serious problems within schools.
- Communication between the secondary and postsecondary levels and between schools and external groups, such as business and state agencies, was instrumental to successful implementation. Continued expansion of articulation agreements was traced to deliberate commitments to on-going communication of key personnel at the secondary and postsecondary levels.

External Factors:

- The level of involvement of local consortia in Tech Prep implementation was influenced by the states and their historic role in oversight of vocational education. At least a few persons associated with each consortium commented on the utility of support provided by state officials, while others complained about a lack of consistency in goals and definitions and an overabundance of paperwork and unnecessary interference.
- Business and industry firms often played a supportive role in encouraging Tech Prep implementation and advocating for raised academic and technical competencies among high school and college graduates. At times, having business leaders voice support for Tech Prep reform strategies provided powerful leverage to resolve conflicts among educational institutions and personnel.

Recommendations for Future Policy and Practice

Based on careful assessment of each local consortium, nine recommendations are offered to enhance Tech Prep reform:

1. Encourage the development of local and state policies that promote articulation agreements supporting transition from high school to college for more students.
2. Increase funding for Tech Prep at both the secondary and postsecondary levels, and utilize these funds to explore innovative curricular and instructional options that serve an increasingly diverse student population. Encourage a greater focus on Tech Prep programs that enhance access and opportunity at the postsecondary level.
3. Continue to associate Tech Prep with raised academic standards at the secondary and postsecondary levels as well as enhanced career opportunities, including employment in professional and technical occupations beyond the 2-year degree.
4. Involve 4-year colleges and universities in Tech Prep curriculum reform from the beginning, not as an afterthought.

5. Continue to utilize reform concepts affiliated with Tech Prep to enhance CTE, but do not confuse Tech Prep with conceptualizations of CTE that encourage immediate employment after high school.
6. Avoid conceptualizations of Tech Prep that involve tracking of students possessing particular academic abilities or other personal traits; Tech Prep should be accessible to all learners, and support services should be provided so that these students can be successful.
7. Encourage partnerships with business, industry, labor, and community groups that support a sustainable approach to Tech Prep, emphasizing advanced academic and career-technical education sensitive to academic reforms, larger economic changes, and local market forces.
8. Strengthen the role of community colleges by recognizing and learning from the lessons that successful Tech Prep consortia have gained by involving their postsecondary partners in important ways.
9. Enhance program evaluation and outcomes assessment approaches to insure that Tech Prep programs continue to advance and improve.

INTRODUCTION

Improving education on behalf of the typical American high school student was the theme of Parnell's 1985 book, *The Neglected Majority*. Having heard the "clarion call to the American people" of *A Nation at Risk* (National Commission on Excellence in Education, 1983, p. 3), Parnell rejected the conclusion that a bachelor's degree is the only road to excellence. He countered that "the varieties of excellence we [educators] aspire to achieve in our universal education system must match to a sufficient degree the sheer diversity of our students" (p. 10). In order for educational reform to meet the needs of the majority of youths in America, Parnell emphasized the liberal arts *and* the practical arts. He argued that,

Educational excellence must be defined in terms of connectedness and applicability, particularly for the sixty or seventy percent of the population who do not work as well, nor as effectively, when dealing with the abstract.... Balance, connectedness, and continuity are key words in any reshaping of the curriculum aimed at improving the education of the middle quartile of students. (Parnell, 1985, p. 134)

Parnell's ideas about technical preparation (Tech Prep) as an educational reform for the neglected majority emerged on the cusp of what some scholars have labeled the "new vocationalism" (see, for example, Grubb, 1997; Lynch, 2000). Lynch described the new vocationalism as central to comprehensive reform of American high schools, and he defined new career and technical education (CTE) programs as focused on rigorous industry standards and workplace requirements, high academic standards, contextually-based instructional applications, and in-school and onsite work experiences that facilitate mastery of core academic and technical competencies. Bragg (2001b) added that the new vocationalism involves a progression of occupational preparation, from entry-level to professional; that constructing educational opportunities to facilitate career leaders and life-long learning is essential; that understanding the changing nature of work and education is instrumental to integrating academic and CTE curriculum; that learner-centered, project-based instructional approaches facilitate learning for all students; and that new vocationalism needs to be respectful of the growing diversity of learners and their multiplicity of goals. Consequently, full infusion of the new vocationalism needs to be linked to the evolving mission of a reformed P-16 educational system that insures that all students have viable opportunities to access and achieve success at all levels of the educational system.

Changes of this magnitude are not easy. Numerous scholars, policy makers, and educators have criticized various forms of CTE in America, often pointing to the disconnect between federal policy-driven goals, local practice, and outcomes realized by students. Little (1996) cautioned "change of the form, content, and status of CTE seems highly unlikely, unless explicitly embraced as an element of a reform agenda" (p. 2). She noted that the deep separation of academic from vocational education has perpetuated the marginal status of CTE in American high schools. In studying approaches to the new vocationalism within high schools, Little observed that progress on reform was most evident when the dual mission of preparation for work and preparation for college was emphasized, and when joint planning time and professional development were dedicated to supporting interdisciplinary teams of faculty. She concluded,

however, that fuller and more successful models of the new vocationalism were unlikely unless "schools succeed at placing 'work' more visibly on the agenda of schoolwide goal-setting and redesign" (p. vi).

Drawing upon his extensive studies of educational change, Fullan (2001) observed of the struggle to reform American schools,

Confronting the isolationism and privatism of educational systems is a tall order. It requires intensive action sustained over several years to make it possible both physically and attitudinally for teachers to work naturally together in joint planning; observation of each other's practice; and seeking, testing, and revising teaching strategies on a continuous basis. Reform is not just putting into place the latest policy. It means changing the cultures of the classrooms, the schools, the districts, the universities, and so on. There is much more to educational reform than most people realize (p. 7).

According to Fullan and others [see, for example, Elmore (2000); Tyack & Cuban (1995)], the educational change process is extremely complex and incredibly unpredictable. It is characterized by the overlapping phases of initiation, implementation, and institutionalization (also referred to as continuation). The parallels between Fullan's conceptualization and the earlier work on innovation inside and outside education by Berman and McLaughlin (1977), Rogers (1995), and others are readily apparent because scholars writing about reform today recognize the growing diversity of students and the proliferation of multiple opinions and perspectives held by parents, community members, business and industrial leaders, and the public at large. Fullan (2001) speaks forthrightly in his latest writing about the difficulties in making educational changes last within schools, reminding educators of the difficulty with which schools respond to changes in the internal and external environment, reflecting the recalcitrant nature of educational systems. He warns educators to expect disappointments, but also suggests that, though often slow, progress can occur.

What factors contribute to successful educational change? Fullan's list of factors is long and ever-evolving, but he is confident that the following contributors are needed to initiate the process: a well-designed innovation, access to information about the innovation, supportive leadership, teacher advocacy, access to external change agents, community engagement to push the reform, adequate funding, and a strong capacity-building orientation. A myriad of internal and external factors influence implementation and eventual continuation, having a profound influence on the educational change process. Figure 1 provides a visual representation of Fullan's conceptual framework, positing relationships among the characteristics of change, local characteristics, external factors, and implementation.

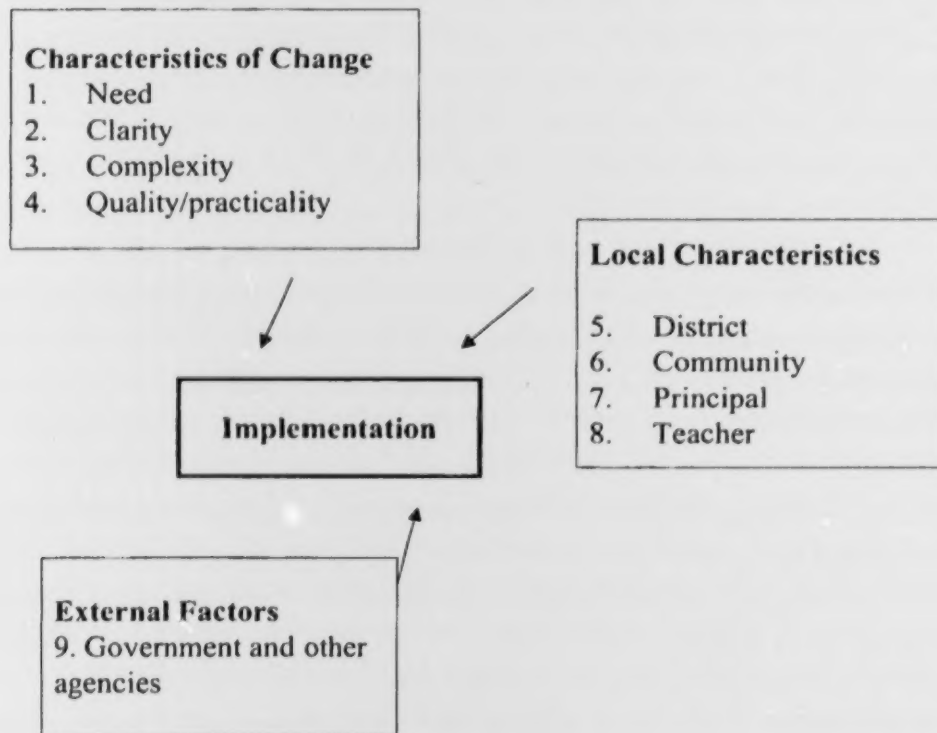


Figure 1. Fullan (2001) conceptualization of interactive factors affecting implementation

Drawing upon his extensive research on a wide range of educational innovations, Fullan postulates that there is a cluster of characteristics about the change itself that affect implementation. Specifically, educators must be convinced the change addresses a significant unmet need and that they are making progress toward meeting the need in the initial stages of implementation. Second, educators need to gain a clear grasp of the essential features of the innovation, along with their role in implementing it. This idea is closely related to Fullan's third point, which is that educators need to gain a clear understanding of the complexity of the innovation and the extent of change required of them to implement it. Fullan explains,

simple changes may be easier to carry out, but they may not make much of a difference. Complex changes promise to accomplish more, which is good news given the kinds of changes in progress these days, but they also demand more effort, and failure takes a greater toll. (2001, p. 78)

The fourth characteristic of educational change is the quality and practicality of the effort, referring to having a reasonable timeline and expectations for change that make sense to teachers and are supported by local administrators.

A second set of concepts affecting implementation of change is embedded in the local context, including board and community characteristics, the principal's involvement and teachers' roles. Fullan suggests boards and community groups can play a profound role in implementation by either supporting or undermining reform, by allocating resources, or by withholding support. Looking at the building level, principals influence whether change proceeds successfully by showing their support for changes, showing active involvement in professional development workshops, and shaping "the organizational conditions necessary for success, such as the development of shared goals, collaborative work structures and climates, and procedures for monitoring results" (p. 83). Likewise, teachers can influence change by engaging enthusiastically and collaboratively, depending upon their individual psychological disposition toward change and their willingness to engage collegially with peers to address improvement opportunities.

External factors are a third category that should be considered highly influential of change. State and federal education agencies and other external groups fit in this category as they represent political forces and special interest group influencers who see themselves as having a vital stake in the reform process. These entities can pressure educational entities and educators to behave in ways consistent with their perspectives, either supporting or inhibiting the change.

Tech Prep as Reform

Passage of the Tech Prep Education Act, as part of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 (commonly known as Perkins II), launched the concept of Tech Prep nationwide as a vehicle of educational change. The Perkins II law initiated planning and implementation of Tech Prep programs through federal grants awarded to states, beginning in 1991, to establish local consortia. These loosely structured organizations, configured in a myriad of ways with a diversity of partners, focused on the creation of articulated secondary and postsecondary curricula. Often supported by articulation agreements between high schools and community colleges that pre-dated Perkins II, Tech Prep enhanced the development of 2+2 core curricula involving the integration of academic and CTE (Silverberg, 1996), signifying that the last 2 years of high school would provide a seamless transition to the first 2 years of college.

Modest in scale relative to funding for federal CTE and later the School-to-Work Opportunities Act (STWOA) of 1994, Tech Prep has emphasized the integration of academic and vocational curricula, applied academics, and contextual learning, creating its own unique brand of 1990s-style educational reform. This is because, contrary to many mainstream reforms such as the Coalition for Essential Schools, Tech Prep centered on CTE. During the decade of the 1990s, Tech Prep programs proliferated and student participation grew (see, for example, Hershey, Silverberg, Owens, & Hulsey, 1998; Silverberg, 1996). By the fall of 1995, Tech Prep was offered in well over half of the comprehensive high schools and the vast majority of community

colleges in the United States (Bragg et al., 1997; Hershey et al., 1998; Silverberg, 1996). Unfortunately, national enrollment statistics for Tech Prep are not available after 1995, though there is little doubt that enrollments have grown at both the secondary and postsecondary levels.

The national evaluation of Tech Prep sponsored by Office of Vocational and Adult Education (OVAE) and conducted by Hershey et al. (1998) offers several important conclusions about Tech Prep implementation as a precursor to reauthorization of legislation of the Carl D. Perkins Vocational and Technical Education Act of 1998 (known as Perkins III). First, Tech Prep consortia are credited with strengthening local collaboration, increasing career guidance, emphasizing applied instruction, and linking employers more closely to students. At the same time, however, Tech Prep had taken on diverse forms, with some models closer to the components specified in the legislation, and thereby more advantageous than others. Third, only modest effort had gone into creating seamless transition pathways from secondary to postsecondary education. Hershey et al. concluded, therefore, that enhanced state and federal leadership would be beneficial, and that more structured programs of study would be needed. A distinct federal initiative and separate funding vehicle was recommended. Interestingly, Hershey et al. offered lukewarm support for Tech Prep as a whole-school change strategy, but argued for federal and state support to develop "Tech-Prep programs of study as an option for some students in most schools, to maximize chances of strengthening their success in school and their sense of career direction for the future" (Hershey et al., 1998, p. xxii).

Reauthorization of vocational legislation in 1998 continued the federal government's enhanced commitment to Tech Prep, with its emphasis on articulation to postsecondary education and curriculum integration. In fact, rather modest changes were noted in the seven "essential elements" of Perkins III as compared to Perkins II, but some are indeed evident. (Table 1 provides a brief description of the essential elements represented in the Perkins II and Perkins III legislation.)

Specifically, Perkins III placed greater emphasis on changing instructional strategies at both the secondary *and* postsecondary levels, encouraging contextual teaching and learning, and work-based learning (WBL). Perkins III also supported the idea of articulation of Tech Prep programs with baccalaureate-degree programs, creating 2+2+2 options. Also, there was no longer ambiguity about whether states needed to report performance results specifically for Tech Prep to demonstrate accountability. Indeed, under Perkins III, Tech Prep results were deemed equally as important as those for the rest of CTE in state-level reporting.

Table 1

Essential Elements of Tech Prep in the Perkins II and Perkins III Legislation

Perkins II (1990)	Perkins III (1998)
1. Articulation agreement between the participants in the consortium.	1. Articulation agreement between the participants in the consortium.
2. Two years of secondary school preceding graduation and 2 years of higher education, or an apprenticeship of at least 2 years following secondary instruction, with a common core of required proficiency in math, science, communications, and technologies designed to lead to an associate degree or certificate in a specific career field.	2. Two years of secondary school preceding graduation and 2 years or more of higher education, or an apprenticeship program of at least 2 years following secondary instruction, with a common core of required proficiency in math, science, reading, writing, communications, and technologies designed to lead to an associate degree or a postsecondary certificate in a specific career field.
3. Include the development of Tech Prep program curricula appropriate to the needs of consortium participants.	3. Include the development of Tech Prep programs for both secondary and postsecondary, including consortium, participants in the consortium that— (A) meets academic standards developed by the State; (B) links secondary schools and 2-year postsecondary institutions, and, if possible and practicable, 4-year institutions of higher education through nonduplicative sequences of courses in career fields, including the investigation of opportunities for Tech Prep secondary students to enroll concurrently in secondary and postsecondary coursework; (C) uses, if appropriate and available, work-based or worksite learning in conjunction with business and all aspects of an industry; and (D) uses educational technology and distance learning, as appropriate, to involve all the consortium partners more fully in the development and operation of programs.
4. Include in-service training for teachers that— is designed to train teachers to implement Tech Prep; provides for joint training for teachers from all participants in the consortium; and may provide such training on weekends, evenings, summers, or in workshops.	(4) Include in-service training for teachers that— is designed to train vocational and technical teachers to effectively implement Tech Prep programs; provides for joint training for teachers in the Tech Prep consortium; is designed to insure that teachers and administrators stay current with the needs, expectations, and methods of business and all aspects of an industry; focuses on training postsecondary education faculty in the use of contextual and applied curricula and instruction; and provides training in the use and application of technology.

5. Include training programs for counselors designed to enable counselors to more effectively— recruit students for Tech Prep; insure that such students successfully complete such programs; and insure that such students are placed in appropriate employment.	5. Include training programs for counselors designed to enable counselors to more effectively— provide information to students regarding Tech Prep education programs; support student progress in completing Tech Prep programs; provide information on related employment opportunities; insure that such students are placed in appropriate employment; and stay current with the needs, expectations, and methods of business and all aspects of an industry.
6. Provide equal access to the full range of Tech Prep programs to individuals who are members of special populations, including the development of Tech Prep services appropriate to the needs of such individuals.	6. Provide equal access to the full range of technical preparation programs to individuals who are members of special populations, including the development of Tech Prep program services appropriate to the needs of special populations.
7. Provide for preparatory services that assist all participants in such programs.	7. Provide for preparatory services that assist participants in Tech Prep programs.

Sources: Carl D. Perkins Vocational and Applied Technology Education Act of 1990, Carl D. Perkins Vocational and Technical Education Act of 1998.

Enduring Policy Concerns

Since Tech Prep legislation was passed, questions have been raised about its intent and focus, especially pertaining to the main target audience, the merit of applied academics and contextual learning, and the role of community colleges. Christopher Lyons, OVAE specialist on Tech Prep, summarized a number of the most serious policy issues in a communiqué referred to as a USDoE/OVAE Chat, dated May 9, 2001. Lyons' observations, along with a rejoinder by the National Association of Tech Prep Leadership (NATPL), also included in Lyon's communiqué, are presented here because the interchange provides a window by which to examine important policy issues. This dialogue gives a useful framework for understanding enduring policy issues that surround Tech Prep.

Lyons began his communiqué focusing on the notion of whether Tech Prep is facilitating a pipeline for student transition from secondary to postsecondary education—a concern raised by the national evaluation of Tech Prep by Hershey et al. (1998). He observed that “increasing numbers of formal, secondary-to-postsecondary, program-to-program articulation agreements have been negotiated in states and localities,” but articulation agreements have not necessarily facilitated the transition of high school students into postsecondary education. This statement was followed with a question: How should the Tech Prep community respond to these charges? To this, the NATPL claimed the full impact of articulation has only just begun, arguing that when Tech Prep programs reach a critical mass of students, its impact can be measured in terms of the progression of students into college in Tech Prep programs. This point is a particularly

important one, because it gets at the notion of how Tech Prep, as a vehicle for articulated curriculum, has contributed to student transition to college. Apparently both parties agree that articulation has taken place, though student participation may be more limited than was expected originally. Lyons questions whether impact should be notable already; NATPL sees implementation and impact continuing to evolve, raising questions about a reasonable timeline for change of this magnitude.

Next, Lyons observed that states had created a wide variation of definitions for Tech Prep programs and Tech Prep students, complicating the federal government's estimates of enrollments and its ability to determine performance nationally. He illustrated this point by saying that some states count students only after they have received an associate degree in an articulated college-level program, whereas others count every secondary CTE student as a Tech Prep student. Lyons then asked if such "wide definitions" are a challenge or an opportunity. He postulated that some of the differences in the way states define Tech Prep students are linked to philosophical differences about the core mission and meaning of Tech Prep education. NATPL leaders responded by calling for common definitions based on the NATPL-endorsed definition of Tech Prep as a minimum requirement. But NATPL also acknowledged that states should have latitude to "tweak" national definitions to satisfy state and local needs. NATPL leaders reinforced a foundational tenet advanced by Parnell (1985): Tech Prep should be committed to the neglected majority by offering integrated curriculum and contextual and applied academics, and by addressing high skill, high wage careers requiring at least 2 years of postsecondary education or apprenticeships beyond high school. Neither of these priorities should jeopardize the rigor of the curriculum because Tech Prep should combine college prep and workforce prep.

Connections between Tech Prep and traditional CTE vary across the nation, and NATPL leaders offered concern regarding tight relationships that stigmatized Tech Prep as no different than CTE. They thought that Tech Prep would not be successful unless it overcame the stigma of traditional CTE by saying,

While we realize changes are occurring in the 'new voc. ed.,' Tech Prep still remains distinct from CTE. The general public does not understand changes in workforce needs. For Tech Prep and CTE to move forward, both need to be clearly and obviously differentiated from each other. Tech Prep is now and has always been designated as a College Prep program designed to address both academic and technical education to meet workforce development needs.... [T]he bottom line is that 'College Tech Prep' and the 2+2+2 articulation agreements provide a wider scope of opportunities for students. Educators should never limit options for students by building terminal education silos at any level.

This interchange between Lyons and NATPL is particularly interesting because it portrays the complexity of the interrelationship between Tech Prep and CTE, raising questions about whether Tech Prep has established a valued presence distinct from CTE.

Lyons tackled a related concern when he asked how the federal government should deal with counting Tech Prep students at the postsecondary level by observing,

Like College Prep, Tech Prep is a pathway that leads high school students into postsecondary education. No separate enrollment reports are filed on College Prep students who enter 4-year programs. Should we expect community and technical colleges to maintain separate counts of former Tech Prep students who have enrolled in a 2-year program? Should we foster a follow-up system that can account for the future educational and labor market success of secondary TP students?

NATPL recommended a student follow-up tracking system—for 4-year or 2-year students—to account for the success of secondary Tech Prep students. Indeed, NATPL claimed “this type of data should be driving the change in education.” Without such a tracking system, NATPL suggested Tech Prep would have a difficult time substantiating its benefits in terms of the educational and labor market success of secondary Tech Prep students. A lack of follow-up data limits the ability of agencies on all levels to document the scope, scale, and quality of Tech Prep, which is increasingly important as the initiative matures. A fundamental reason for this problem is a lack of an evaluation requirement in the original (1990) legislation, combined with limited resources that can be dedicated to state administrative functions. These factors, along with a lack of technical expertise to execute sophisticated evaluation designs at either the local or state levels, have dampened the ability of most states to conduct student follow-up studies.

Finally, Lyons observed that Tech Prep might properly and legitimately be positioned as a leading edge initiative of high school reform: “As the New Voc Ed, THE answer to the crisis of the senior year, the Education of Choice for the 21st Century Workforce.” He questioned if this would be good or bad? NATPL offered its most forceful and pointed response to this question by asserting “Tech Prep is already leading edge. It does not need to be repositioned.” NATPL leaders pointed to a “dissonance” among the ways Tech Prep is viewed at the federal level as opposed to the state and local levels, and how it is perceived by OVAE in ways that are inconsistent with perceptions held by practitioners in the field. NATPL leaders asked federal officials to stop referring to Tech Prep as a “new initiative,” believing this perspective devalues progress already achieved in states and localities. A discontinuity in purpose and lack of understanding of advancement are evident in these statements—raising questions about fundamental expectations and reasonable timelines for implementation of change.

To summarize, this interchange between Lyons and NATPL is indicative of the intensity and importance of significant policy issues surrounding the Tech Prep reform. These concerns have been documented by other researchers (see, for example, Hershey et al., 1998), and they continue to be at the forefront of conversations of practitioners throughout the nation. Knowing about these issues is important to understanding how Tech Prep implementation has evolved in recent years, particularly since 1998 when Perkins III was enacted. By conducting in-depth longitudinal case studies of the 8 Tech Prep consortia associated with the Community College and Beyond (CC&B) study, we have attempted to shed new light on these important questions and enhance understanding about change associated with Tech Prep.

The 'Community College and Beyond' Study

Numerous studies have been conducted to better understand planning and implementation under the federal Perkins II legislation (see, for example, Dornsife, 1992; Bragg, Layton, & Hammons, 1994; Grubb, Badway, Bell, & Kraskouskas, 1996; Hershey et al., 1998; and Orr, 1999). Cognizant of these studies, OVAE initiated funding of a longitudinal study of Tech Prep implementation and student outcomes in January 1998 under the direction of Debra Bragg and Carolyn Dornsife, then with the National Center for Research in Vocational Education (NCRVE), University of California at Berkeley. Referred to as the "Community College and Beyond" study, Bragg et al. (1999) launched a mixed-method study that eventually included 8 Tech Prep consortia geographically distributed throughout the country in eight different states (for further detail, see the "Methods" section of this report, p.25). Several consortia were selected because of their long association with NCRVE and the reforms initiated by that organization, but a few were entirely new. The initial 6 consortia chosen in 1997 to be part of the study starting January 1, 1998, were

- The East Central Illinois Education-To-Careers Partnership in Danville, Illinois (referred to as East Central)
- The Metro Consortium¹ (referred to as Metro)
- The Hillsborough Tech Prep Consortium in Hillsborough County and Tampa, Florida (referred to as Hillsborough)
- The Golden Crescent Tech Prep Consortium in Victoria, Texas (referred to as Golden Crescent)
- The Miami Valley Tech Prep Consortium in Dayton, Ohio (referred to as Miami Valley)
- The Mt. Hood Educational Partnership in Mt. Hood, Oregon (referred to as Mt. Hood)

Two additional consortia were added to provide greater geographic diversity and new insights into Tech Prep implementation at the local level. These two sites were especially important because, whereas they too evidenced committed leadership to Tech Prep programs, their histories were not as long as those of the other 6. The 2 added consortia were

- The Guilford College Tech Prep Consortium in Guilford County and Greensboro, North Carolina (referred to as Guilford)
- The San Mateo Tech Prep Consortium in San Mateo County, California (referred to as San Mateo)

¹ A pseudonym is used to protect the identity of this consortium in accordance with the original research protocol agreed upon by UIUC researchers and local officials.

Individually and collectively, these consortia are characterized by the following qualities

- commitment to Tech Prep as a primary vehicle of educational change at the local level (though the exact model and approaches varied across the selected sites);
- use of Tech Prep policies, goals, and strategies endorsed by the state within the local consortium;
- commitment to engaging in local evaluation and assessment of student outcomes (often with state support), along with a willingness to incorporate key aspects of the proposed research design into future plans for local evaluation;
- agreement to participate in the study to share what the consortium has done with others, and to use results to improve local programs;
- represent rural, suburban, and urban schools within a single consortium, to provide a diversity of resources and circumstances within and across the consortia studied; and
- represent approaches to Tech Prep that are not too unique or extreme to offer valuable lessons about implementation to others.

Based on the first 2 years of the CC&B study, two reports were produced describing the evolution of Tech Prep implementation in all the consortia. These reports are titled, *Tech Prep Implementation in the United States: Preliminary Student Outcomes for Eight Local Tech Prep Consortia* (Bragg et. al., 1999) and *Promising Outcomes for Tech Prep Participants in Eight Local Consortia: A Summary of Results* (Bragg, 2001a). Both reports are posted in their entirety on the web site of the National Centers for Career and Technical Education (NCCTE) at <http://www.nccte.org>.

Recapping results on implementation for these 8 consortia gives a useful starting point for understanding what has happened with Tech Prep implementation from 1998 to the present, after passage of Perkins III (or post-Perkins II). Table 2 summarizes key features of the Tech Prep programs operating in each consortium, including their location type, primary partners, high school graduation requirements, tech-prep models, and articulation agreements, to assist the reader in understanding the rich diversity of approaches represented across the 8 consortia. Results of the *Promising Outcomes for Tech Prep Participants in Eight Local Consortia: A Summary of Initial Results* (Bragg, 2001a) further explain the progression of Tech Prep implementation throughout the 1990s, up until passage of Perkins III, for these selected sites.

Table 2

Key Features of the Eight Tech Prep Consortia

	East Central (IL)	Metro (pseudonym)	Hillsborough (FL)	Golden Crescent (TX)
Geographic Setting	Rural, small town	Urban	Urban, suburban, rural	Rural, small town
Primary Partners	12 high schools, 1 area vocational center, 1 community college	15 high schools, 1 technical college offering associate and baccalaureate degrees	18 high schools, 3 adult technical centers, 1 large community college district with 4 campuses	19 high schools, 1 regional career center, 1 community college
Minimum High School Graduation Requirements	- 3 units English - 2 units math - 1 unit science - 2 units social studies	- 4 units English - 3 units math - 3 units science - 4 units social studies	- 4 units English - 3 units math - 3 units science - 3 units social studies	- 4 units English - 3 units math - 2 units science - 2.5 units social studies
Primary Tech Prep Model/ Articulation Agreement	Enhanced vocational Tech Prep, based on 4+2 articulation agreements with some 4+2+2 arrangements. Youth apprenticeship program utilizes a work-based Tech Prep approach.	Integrated Tech Prep, interdisciplinary curriculum, articulated credits, and advanced placement; 2+2 approach, with some 2+2+2 programs.	Enhanced vocational Tech Prep, 4+2 articulated program with some 4+2+2 programs. Agreements include dual enrollment, time-shortened courses, and course-to-course articulation of technical courses.	Enhanced vocational Tech Prep, 4+2 model, with some 4+2+2 programs. Most articulation agreements reflect course-to-course articulation of technical courses and provide dual credit.
Definition of Tech Prep Student	Has made a conscious decision to follow a clearly defined sequence of courses to prepare for employment in a Tech Prep occupation; offers opportunities for above-average entry wages and potential for growth; and requires advanced technical, problem-solving, and creative-thinking skills.	Student in grades 11 and/or 12 who is enrolled in Tech Prep math and English courses and who follows a technical career cluster of courses with the intent of entering the postsecondary Tech Prep curriculum.	One who has completed at least one technical course in an articulated program by grade 11, and two courses each of English, science, and mathematics. A postsecondary Tech Prep student is one who takes an articulated sequence of technical courses the first 2 years of college that lead to an Associate of Applied Science (AAS) degree.	One who is in grades 9–12 and who follows an approved Tech Prep sequence of courses leading to postsecondary education and training. A postsecondary Tech Prep student has an approved major leading to a state-approved Associate of Applied Science (AAS) degree.
Early Career Clusters affiliated with Tech Prep	- Arts, communication, and media - Business and management systems/technologies - Human and public services technologies - Industrial and engineering technologies - Agriculture, natural resources, and agribusiness technologies	- Health and health sciences technologies - Industrial and engineering technologies	- Business and management systems/technologies - Health and health sciences technologies - Human and public services technologies - Industrial and engineering technologies - Agriculture, natural resources, and agribusiness technologies - Construction technologies - Fashion/interior design	- Arts, communications, and media - Business and management systems/technologies - Health and health sciences technologies - Human and public services technologies - Industrial and engineering technologies
Other Key Features	Local businesses were vocal and active partners, encouraging work-based learning opportunities for students, supporting youth apprenticeship programs, and providing work-site learning opportunities to faculty. System focused on linking school-based learning and work-based learning.	Interdisciplinary approaches to academic and vocational integration, secondary to postsecondary transition, and professional development opportunities for high school teachers; college faculty, and local administrators guided consortium efforts.	While emphasizing applied academics, extended emphasis on standard academic courses with contextual learning strategies. Business and industry contribute to the training and development of faculty and counselors to promote awareness beginning in elementary school.	Aspires to strengthen business/industry—postsecondary education relationships. Encourages the use of contextual teaching and learning and provides professional development workshops for faculty. Regional labor market information links education to the economic needs of the region.

	Miami Valley (OH)	Mt. Hood (OR)	Guilford County (NC)	San Mateo County (CA)
Geographic Setting	Urban, suburban, rural	Suburban, urban	Urban, suburban, rural	Urban, suburban
Primary Partners	64 comprehensive high schools feeding into 3 vocational high schools, 1 community college	1 regional educational service district serving 7 high schools, 1 community college district	1 school district that includes 14 high schools, 1 area vocational school, 1 community college	19 high schools, 1 community college district with 3 community colleges
Minimum High School Graduation Requirements	- 3 units English - 2 units math - 1 units science - 2 units social studies	- 4 units English - 2 units math - 2 units science - 2 units social studies	- 4 units English - 3 units math - 3 units science - 3 units social studies	- 3.5 units English - 2 units math - 2 units science - 3 units social studies
Primary Tech Prep Model/Articulation Agreement	Structured, comprehensive Tech Prep model implemented as 2+2 or 2+2+2 arrangements, supported by memoranda of understanding.	Enhanced vocational Tech Prep, 2+2 approach, including advanced or dual credits in either academic or CTE courses.	Structured, comprehensive Tech Prep aligned with College Tech Prep; 4+2 articulation; advanced standing credit and concurrent enrollment.	Enhanced vocational Tech Prep, 2+2 approach. Driving this model are the articulation agreements that provide for dual credit and advanced placement articulation options.
Definition of Tech Prep Student	Enrolled in a state-sanctioned Tech Prep program that begins in grade 11 and continues through the associate degree in the career-technical education and employability competency delivery system.	One who elects to enroll in a major Tech Prep course of study in Grade 11 or 12, and follows an integrated program of academic and technical courses that is linked to 2-year AAS degree programs at the local community college.	One who elects to participate in a sequence of technical courses. College Tech Prep program has served to replace the general track. Youth Apprenticeship based on 2 years of technical courses in high school, followed by a 2-year AAS program.	One who has completed an articulated vocational course in high school that is part of a Tech Prep program of study.
Early Career Clusters associated with Tech Prep	- Business and management systems/technologies - Industrial and engineering technologies - Automotive technologies	- Arts, communication, and media - Business and management systems/technologies - Human and public services technologies - Industrial and engineering technologies - Agriculture, natural resources, and agribusiness technologies - Construction technologies	- Business and management systems/technologies - Health and health sciences technologies - Human and public services technologies - Industrial and engineering technologies - Transportation systems technologies - Automotive technologies - Construction technologies	- Business and management systems/technologies - Health and health sciences technologies - Human and public services technologies - Industrial and engineering technologies - Fashion/interior design
Other Key Features	Driving the Tech Prep curriculum are the skill competencies identified by local business and industry leaders as necessary for employment in particular jobs within an occupational cluster. Faculty work with these partners to develop curriculum based on the identified competencies.	Tech Prep curriculum was influenced by the State Department of Education, state officials, and representatives from the school. Articulated academic courses, career pathways, and links to School-to-Work efforts guided reform. Community members and parents participated in the decision-making process regarding reform efforts.	Has built extensively on the state's early priority for a College Tech Prep course of study, supplemented with a solid commitment from local business and industry to the Youth Apprentice model. Business and industry partnerships have resulted in the establishment of shared goals of improving the skill level and quality of the county's entry-level work force and provide youth with multiple career and educational options.	There has been a deliberate attempt to align the goals and activities of Tech Prep with School-to-Work. Career pathways are used to support seamless high school transitions.

Initial Results of the 'Community College and Beyond' (CC&B) Study

This section presents preliminary results pertaining to the first 2 years of the Community College and Beyond (CC&B) study, drawing heavily on longitudinal case studies conducted during the 1998 and 1999 calendar years. Initial results addressing policy foci, goals, and structures; articulation agreements and models; curriculum and instruction; support services; professional development; and barriers to implementation are presented here. For additional information, readers should consult Bragg et al. (1999) and Bragg (2001a).

First, an important conclusion of previous implementation studies is that Tech Prep has centered mostly on reform of secondary education, with goals and policies broadening toward inclusion of all students at that level. Often this realignment of Tech Prep seemed to be done to better match Tech Prep to the goals of School To Work Opportunities Act, which emphasized educational activities for *all students*. A related realignment occurring during the latter half of the '90s emphasized enhanced linkages between Tech Prep, and efforts to raise academic standards and enhance academic course-taking. Savvy leadership from local Tech Prep coordinators, along with a broad cadre of educational, business, and community advocates, positioned Tech Prep as a solution to student academic achievement problems. These developments were not without controversy or difficulty, because the broadening foci of Tech Prep introduced confusion and disharmony. Of interest, business alliances sometimes provided the impetus for consortium leaders to refocus the goals of Tech Prep on student academic performance, also helping leaders to steer the reform through a milieu of shifting policies, practices, and structures. Some structural changes, such as joint planning teams and block scheduling, contributed to Tech Prep implementation, helping to move it from the margins to the center of school operations. Another valued element encouraging the centrality and importance of Tech Prep reform involved the creation of scholarships for Tech Prep participants, supporting their transition to college.

Articulation agreements are the foundation upon which Tech Prep programs are built, and many benefits are associated with using articulation agreements and related curriculum alignment processes. At the forefront of these benefits is the act of creating articulation policies and agreements, increasing dialogue among secondary and postsecondary educators. In the 8 consortia studied, greater coherency was evident when articulation agreements were tied directly to curriculum content and academic standards. Early on, articulation agreements associated with Tech Prep focused almost exclusively on CTE, rather than academic, education, so the emphasis on academic reform was indirect. More recently, articulation agreements have focused more explicitly on academic courses and, through 2+2+2 agreements, have specified courses leading to baccalaureate degrees.

In a few states (e.g., Illinois, Texas, and North Carolina), articulation has been elevated to state-level status, recognizing the potential to use articulation agreements to strengthen student transition to college. However, state policies on articulation do not always acknowledge or deal favorably with Tech Prep, either neglecting CTE courses or overlooking community colleges in favor of 4-year colleges and universities. Moreover, though articulation agreements had been in place for most of the 1990s in the 8 consortia studied, a pervasive perception shared by program

leaders was that Tech Prep participants were not accessing college credits accumulated during high school. Reasons repeatedly given include that students lacked awareness that their high school courses generated college credit and that faculty discouraged students from capturing credits because they lacked confidence that the students had mastered college-level competencies. A full accounting of articulated enrollment or dual credit was not possible by any consortium studied because none had sufficiently sophisticated tracking systems. However, Tech Prep participation was documented in the quantitative component of the CC&B study in Bragg et al. (in press), showing that, while Tech Prep students are enrolled at the secondary level, a significantly greater proportion enroll in articulated courses than do Tech Prep non-participants.

The forms of Tech Prep implemented by the 8 consortia closely paralleled the categorization proposed by Hershey et al. (1998). Of the three forms of Tech Prep mentioned previously, the 8 consortia displayed extensive evidence of the vocational Tech Prep model, and some indication of the comprehensive, structured model. None implemented what Hershey et al. labeled the "non-targeted approach." Work-based Tech Prep (Bragg, 1995) was also evident in Tech Prep/Youth Apprenticeship (TP/YA) programs in 2 consortia, and Integrated Tech Prep existed in 1 consortium where a particularly heavy emphasis was placed on curriculum integration. One other model was present, and that was the College Tech Prep model. Gathering added momentum in the past few years, College Tech Prep emphasizes academic coursework that meets 4-year college and university admission requirements. Of the 8 consortia studied, College Tech Prep was the predominant form of Tech Prep in 1 consortium, but was evident in the programs of study of some Tech Prep participants in other consortia.

Career clusters were implemented in all consortia in the mid- to late-1990s, and these clusters were associated with new secondary-to-postsecondary curricular pathways. Preceding OVAE's career clusters project (<http://www.ed.gov/offices/OVAE/clusters/index.html>) consortia developed Tech Prep programs utilizing several career clusters, including business and management systems/technologies, health and health sciences technologies, human and public service technologies, industrial and engineering technologies, and computer technologies. Because of the need to prepare faculty to teach these new CTE areas, professional development was a prominent feature of all 8 consortia. Over time, a more diverse group of academic and CTE teachers and counselors became involved in professional development across the secondary and postsecondary levels. Parents, business representatives, community leaders, and students sometimes participated. As Tech Prep shifted from planning to full-scale implementation during the 1990s, professional development was integral to change. Local businesses facilitated in-service activities in some consortia, including providing facilities for training local educators about new technical occupations and the modern work world.

Preparatory services were conceptualized and implemented in different ways within and across the 8 consortia. Increasingly, over the latter half of the 1990s, consortia heightened attention to "college readiness," preparing students for college placement tests and sharpening their college-study skills, usually while they were still in high school. These services facilitated the emphasis of Tech Prep on *all students*, including the group Parnell (1985) labeled the neglected majority. Though starting with the idea of serving the middle 2 quartiles, by the end of

the 1990s, most consortia claimed Tech Prep was for students at any point on the academic ability continuum.

Enhanced implementation efforts involving more teachers, greater emphasis on guidance, more integrated and applied instruction, and heightened recruitment facilitated the growth of Tech Prep during the 1990s. On average, Tech Prep enrollment accounted for about 15% of secondary school total enrollments in the 8 consortia during the 1996-97 academic year. Student participants were similar to the general student population in their high schools in terms of demographics, though Tech Prep participants in 3 consortia were slightly more likely to be from lower income families than were non-participants. In 2 consortia, fewer females participated in Tech Prep than males, and these differences appeared to be associated with enrollment in gender-specific occupations.

Despite increasing enrollments, Tech Prep implementation experienced difficulties in the 1990s, and these were documented in prior studies. Barriers to implementation in the 8 consortia paralleled other major studies (see, for example, Bragg et al., 1994; Hershey, Silverberg, & Owens, 1995; Silverberg, 1996). In reviewing the extant literature, Elliott and Stateleman (2000) argued unclear goals and ambiguous definitions for Tech Prep programs and students were pervasive problems for Tech Prep implementation. Research conducted by Stringfield, Castellano, and Stone (2001), Hershey et al. (1998), Bragg et al. (1999), Orr (1998); and Prestine and Bragg (1998) confirmed an uneasy fit between Tech Prep and K-12 school reforms. Among other barriers, a lack of planning time between academic and vocational faculty at the secondary and postsecondary levels, the failure of 4-year colleges and universities to recognize applied curriculum as legitimate preparation for college, a lack of general awareness about Tech Prep, and limited staff, time, and money were believed to be most serious. Though some of these concerns lessened over time, others continued or even grew.

METHODS

Considering the continued federal commitment to Tech Prep implementation, longitudinal research was needed to understand how local Tech Prep initiatives evolved over time and how they influenced students' educational experiences and outcomes. The CC&B study addressed this void by providing an in-depth description of 8 selected Tech Prep consortia, focusing on implementation policies and practices. During the initial phase of data collection during the 1998-99 academic year, field visits were made to the 8 selected consortia to address the following research questions: How has Tech Prep evolved since its initial implementation? What goals, policies, and definitions are linked to Tech Prep, and how are they related to School-to-Work (STW), CTE, and other reforms? What are the predominant components of Tech Prep, and which of these components are evident at the secondary and postsecondary levels?

During the recent phase of data collection, when follow-up visits were conducted in 2000-01, additional research questions were posed: What *major changes* in goals, policies, approaches, and practices have occurred in this consortium (involving high schools, the community college, business partners, or other affiliated organizations) during the 1998-2001 period? What *major changes* were evident to various local stakeholders during this same period of time, and to what extent are these changes associated with Perkins III? What are the predominant *contributors to change*? How do factors such as state policy, local leadership, faculty involvement, resources, and business and industry engagement influence change?

In terms of this study, a *major change* represented a shift or alteration in policy or practice that was evident to multiple stakeholders during the period since 1998-99, since Perkins III provided oversight over Tech Prep implementation. Our data collection teams attempted to identify major changes based on their understanding of past policy and practice from prior first-hand knowledge of the consortia. In all but two cases, the same research team that conducted the visit in 1998-99 returned to the consortium in 2000-01, providing an external perspective on educational reform. Prior to conducting each field visit, each on-site research team became immersed in notes, documentation, and other artifacts collected during the initial visits in 1998-99, including familiarizing themselves with the baseline report prepared by Bragg et al. (1999) titled *Tech Prep Implementation in the United States: Preliminary Student Outcomes for Eight Local Tech Prep Consortia*. To enhance the veracity of recent data collection, except in two cases, the same researchers who conducted the initial site visits in 1998-99 were employed for the return visit in 2000-01.

Usually teams of two or three researchers were engaged in data collection for a 2-3-day period (averaging approximately 40 hours of on-site interviewing per site), providing the opportunity to visit the most centrally involved schools, colleges, businesses, and other affiliated partners. During each visit, approximately 20-25 educational administrators, faculty, counselors, students, and business and community persons were interviewed. Most persons were identified to us as involved in some manner with Tech Prep, though not always. Information gathered from teachers and students enrolled in schools or colleges known to implement Tech Prep, but who had no direct connection to it, provided valuable understanding of perceptions held by the broader academic community.

By utilizing teams of researchers who had a long-term affiliation with each site, we were able to gain greater understanding of Tech Prep implementation over time. Our hunch was that understanding the past was crucial to identifying change, however subtle or dramatic, in the present. Having respondents tell us about major changes was insightful because we were able to extract from the data predominant patterns or themes representing local respondents' perceptions. Because most of our own data collection teams had visited the same settings previously, we could identify notable developments and differences. This external perspective was particularly important because turnover among consortium leaders sometimes created obstacles to long-term memories about consortium policies and practices. In a few cases, our research teams had more knowledge of the history of the consortium than local personnel.

As was mentioned above, in only two cases did we employ new researchers who were not previously engaged in the study to conduct field visits. These individuals studied 2 different consortia located in the western region of the United States. Because of their extensive knowledge of the region and in-depth understanding of educational policy and practice in this region over the decade of the 1990s, these researchers brought a rich and highly valued perspective similar to teams assigned to other sites. To insure consistency of focus and data collection across all sites, the preliminary report of the CC&B study (Bragg et al., 1999) was reviewed, current research questions were provided, and a general interview protocol was prepared. These same materials were made available to all researchers involved in the study, regardless of whether they were involved in previous site visits or not.

In addition to the site visits, the principal investigator maintained contact with the leadership of each consortium via e-mail, newsletters, and other correspondence and communiqués throughout the life of the study, providing another means of learning about change. Many consortium personnel kept in touch with our research staff using e-mail on a regular basis and by keeping them on mailing lists, giving us fairly continuous public information about local Tech Prep initiatives. Several local leaders also sent copies of consortium reports, plans, and studies conducted locally or by state agencies. Together, these means of communication kept our research teams informed over time.

In terms of our approach to data collection during the site visits, open-ended interview questions were used primarily, and these questions were cross-walked to goals, policies, strategies, and approaches associated with Tech Prep implementation, building on the literature and previous practice. The particular interview questions used in 2000–01 were not identical, but similar, to questions asked in 1998–99 because of the need to capture more up-to-date policies and practices (see Bragg et al., 1999). We did not emphasize that our focus was Tech Prep, but rather that we were interested in understanding change. Eventually it was necessary to ask questions about Tech Prep, but consistently these questions were embedded in conversations about educational change that asked local informants to put Tech Prep into the context of the broader local and state environments.

Many of our interviews were recorded and later transcribed, but sometimes only handwritten notes were taken so that tape recorders did not interfere with the establishment of trust between interviewer and interviewee. In all cases, confidentiality was emphasized, and respondents were

asked to give consent to providing information verbally. In terms of insuring the reliability of results, triangulation was employed by examining multiple data sources and multiple informant perspectives, maximizing our confidence in the trustworthiness of results (Lincoln & Guba, 1985). We also conducted member checking, asking local participants to comment on preliminary conclusions as well as the clarity and accuracy of draft reports. This was handled by having the lead researcher on each team draft a case report based on a common outline. The framework for the site reports focused on brief introductory information about the consortium's goals for Tech Prep evident prior to 1998-99, summary information about major changes in Tech Prep implementation between 1998-99 and 2000-01, and a discussion of how and why these changes might have come about, including insights about how major changes related to Perkins III.

Analysis of qualitative data involved the classification of themes and patterns utilizing content analysis (Lincoln & Guba, 1985). In some cases, simple descriptive statistics were calculated to give counts of these themes and patterns, including reporting whether phenomena were occurring independently or in conjunction with another phenomena. In addition, document analysis was conducted utilizing local consortium artifacts (e.g., final reports, curriculum guides, brochures, strategic plans) according to qualitative data analysis procedures articulated by Lincoln and Guba (1985) and Patton (1990). Over time, the files associated with each site have become voluminous, so materials have been catalogued to provide easy access by the research team. Still, managing the extensive amount of information collected through a longitudinal study such as this is a tremendously time-consuming task, but highly important to the overall research endeavor.

INDIVIDUAL CASE RESULTS

This section provides a relatively brief description of major changes that have occurred since 1998–99 in each of 8 Tech Prep consortia. After discussing major changes, each case provides a discussion of factors that appear to contribute to change, which we referred to as contributors to change, because of our concern to not presume cause-effect relationships based on qualitative evidence alone. We encourage readers to view the cases as examples of Tech Prep reform where real-world educational change is influenced by a whole host of contributors, including those associated with the local context, external forces, the change itself (Fullan, 2001) and other factors.

The eight cases, as ordered in this document are

- The East Central Illinois Education-To-Careers Partnership in Danville, Illinois (referred to as East Central)
- The Metropolitan Consortium (referred to as Metro)
- The Hillsborough Tech Prep Consortium in Hillsborough County and Tampa, Florida (referred to as Hillsborough)
- The Golden Crescent Tech Prep Consortium in Victoria, Texas (referred to as Golden Crescent)
- The Miami Valley Tech Prep Consortium in Dayton, Ohio (referred to as Miami Valley)
- The Mt. Hood Educational Partnership in Mt. Hood, Oregon (referred to as Mt. Hood)
- The Guilford College Tech Prep Consortium in Guilford County and Greensboro, North Carolina (referred to as Guilford)
- The San Mateo Tech Prep Consortium in San Mateo County, California (referred to as San Mateo)

East Central Illinois Education-To-Careers Partnership

Introduction

The goal of the Tech Prep initiative in the East Central Illinois Education-to-Careers (ETC) Partnership (<http://www.etcworks.org/>) headquartered in Danville, IL, has been to provide educational opportunities to students identified as the neglected majority. The consortium utilizes two forms of Tech Prep. One is a general Tech Prep program that draws heavily on traditional CTE course-taking either through the comprehensive high school curriculum or the area vocational center (AVC). The second form is the Tech Prep/Youth Apprenticeship program. To date, the general Tech Prep program has been open to all high school students who want to participate, but the youth apprenticeship program has utilized a selective admissions process,

emphasizing congruence between students' career and college goals and the Tech Prep program goals, good attendance, positive attitude, and at least average grades. A central goal of Tech Prep, overall, is to utilize CTE to assist more students to transition to college or entry-level employment in careers affiliated with the Tech Prep initiative (For further background on this consortium and others presented in this report, see Bragg et al., 1999).

In recent years, secondary-level leaders have revised their goals for this consortium. Principals and superintendents have met to propose goals that introduce new curriculum such as training for CISCO technology and law enforcement. At the same time, leaders have returned to old goals with the intention of bolstering efforts already underway for several years. This includes a recognition that articulation needs to be strengthened and that transition from secondary to postsecondary is not as smooth as it should be.

The consortium is also making a concerted effort to bring curriculum into alignment with state goals that include more consistency in identifying and tracking students who participate in Tech Prep programs in accordance with the state's definitions and policies. The consortium also continues to emphasize employability and CTE skills development as central to local efforts, with a commonly held belief that these goals should serve the region's overall objectives for enhancing the local workforce and economy.

Major Changes

Business and Industry Involvement. Local business and industries have been strong stakeholders in the implementation of Tech Prep in this consortium. They were especially active consortium partners through their encouragement of work-based learning (WBL) opportunities for students, being key drivers of initial development of the youth apprenticeship program. They also facilitated the professional development of faculty by providing WBL opportunities for faculty, and they nurtured the idea of integrating academic and CTE education by supporting interdisciplinary curriculum development activities.

Since the implementation of Tech Prep, the WBL component has developed into two basic thrusts: job shadowing and youth apprenticeships. Business and industry has been supportive of the development of Tech Prep programs in this region, including having business persons travel with school officials domestically and abroad as part of a Tech Prep-related benchmarking and program improvement project. In recent years, business partners have continued involvement, including active participation in consortium governance and career fairs for secondary students. They have also provided mentors for high school students, along with job shadowing and other WBL experiences. Additionally, they have provided WBL experiences for faculty of the high schools and local community college through tours of worksites and mentoring of these professionals.

From the standpoint of educators, a particularly important contribution of business and industry has been their on-going presence and encouragement to make significant changes, giving local leaders of Tech Prep the leverage they need to implement reform, including active advocacy for the creation of career pathways, for raising academic requirements, and for creating new CTE programs and courses. Business and industry is especially vital to keeping momentum

going over time. Since 1998, business and industry's involvement has continued to concentrate on participating in career fairs and guest speaking in various courses, as well as providing WBL opportunities. Through the continuing sponsorship of local business and industry, 10th-grade students can apply for the youth apprenticeship program, which has historically been seen as the crowning jewel of Tech Prep in this consortium.

Youth Apprenticeships. The youth apprenticeship program is an example of curriculum reform that was initiated by business and industry as early as 1993-94. The objective of this reform was to create a sequence of courses that would develop competencies for careers related to various Tech Prep programs of study. As area business and industry became interested in the concept of youth apprenticeships, the consortium expanded the available programs to accommodate the specific needs of particular occupations. The vast majority of the youth apprenticeships were associated with manufacturing firms in the region, and these apprenticeships were intended to provide students at the secondary and postsecondary levels with academic credit earned through participation in supervised WBL experiences, combined with academic and vocational training. The youth apprenticeship program consisted of a specific sequence of articulated courses to create a non-duplicative and progressively challenging career pathway.

Whereas a supportive relationship between the educational system and the local business and industry sector continues, a softening of support has occurred due to a downturn in the economy. Feeling the effects of a weakening economy for more than 2 years, some businesses, including those once highly involved in youth apprenticeships, have either downsized or left the area. Some businesses remaining in the area have chosen to discontinue participation. Consequently, enrollments in the youth apprenticeship program have decreased sharply in recent years. In assessing the situation, some educational leaders observe that businesses have not been entirely satisfied with the student apprentices, complaining that students lack critical skills. Students have expressed discontentment, too, attributing their reasons for dropping out to a desire to find education and career opportunities elsewhere. Also, once some students get to college, they find their experiences in the worksites limiting and unsatisfactory.

Given the intimate involvement of business and industry in this fundamental aspect of curriculum reform, it is not surprising that, when participation of key business partners diminished, the youth apprenticeship program weakened. The extent of this decline is reflected in students' negative perceptions of various aspects of the youth apprenticeship program. Some students lose interest in the occupation to which they have apprenticed as they mature. Upon reaching college, they want to abandon the program in favor of other goals and career opportunities. Some educators are dissatisfied with the youth apprenticeship too, noting that students have not received the job placement guarantees they expected, that they sometimes work in unfavorable conditions, and that their work can be repetitive and boring. Since Tech Prep is billed as a pathway to high-technology, high-paying careers, it is not surprising that students describe themselves as "feeling cheated," and that they do not believe that they have gained access to the high-tech careers they were promised.

It remains to be seen whether the involvement of business and industry in youth apprenticeships is coming to a close or merely evolving into something more reflective of the current economic climate. Evidence suggests that the latter might be the case. An Information Technology (IT) cluster organized by the community's local economic development organization has begun to recruit member businesses, and offer apprenticeships and internships. The goal of this IT cluster is to recruit 45 businesses into active involvement within the next year. Thus, the particular curriculum reform of the youth apprentice program may survive, but education leaders will undoubtedly need to maintain a working relationship with business and industry to accomplish this goal. Consortium leaders continue to seek out and encourage more business involvement, and have had some successes in doing so.

The consortium is also developing alternative forms of curriculum delivery, building upon other aspects of the youth apprenticeship model. The largest high school in the region, which has played a major role in Tech Prep historically at the secondary level, is developing two career academies. One academy, which will be a 3-year program emphasizing College Prep curriculum, encompassing grades 10–12, is in the initial stages of implementation. This academy, the Academy In Medical Science (AIMS), emphasizes health occupations. A second academy, Manufacturing, Engineering, Robotics, Industry, Technology (MERIT), focuses on metals, allowing dual enrollment with the community college in English and CAD/CAM. These academies are characterized by a core curriculum that combines academic and CTE courses, emphasizing the College Tech Prep model.

These academies differ from youth apprenticeships because they are not paid positions, but rather directly lead into community college degree programs. They also feature mentors, who are community professionals, encouraging students to visit business work-sites to facilitate WBL for them. Indeed, the academy model may be an appropriate response to sagging support for the apprenticeship model by business and industry, because it does not require the same level of resources to sustain the programs. At the same time, it does provide students with WBL, mentoring, and transition connections with the community college through dual enrollment.

General Tech Prep. Efforts to implement a general Tech Prep curriculum have not been easily sustained because of the predominance of the secondary College Prep curriculum and difficulties with manipulating school schedules and finding joint planning time for academic and CTE instructors. In predominantly small, rural schools, making changes to foster curriculum reform has been difficult, partly due to resource constraints. Some high schools are able to implement applied academics, and students can enroll in these courses while, at the same time, taking classes at the area vocational center (AVC). In so doing, the youth apprenticeship program and other CTE programs provide deliberate means to apply Tech Prep within the consortium. Other schools have not facilitated these changes though, and their curricula show few differences from the past. Even in schools that have changed their offerings to accommodate Tech Prep, the students sometimes have limited opportunity to take higher-level academic courses because advanced academic courses in the home high schools are scheduled against CTE courses in the AVC. Many Tech Prep students get caught in the in the middle, resulting in their dropping academic courses for CTE ones.

Career Clusters and Pathways. The consortium is now creating career clusters or career pathways. An example is the metal cluster, offering NIMS certification, a nationally-certification program in metal and machining. New teachers affiliated with this program have been hired and certified. Businesses and the community college are donating equipment to the AVC, and this program currently recruits up to 15 junior and senior students some of whom may enroll in the youth apprenticeship program eventually.

In addition, IT classes are offered in CISCO training that leads to a freestanding certificate after four classes, and to a Networking associate degree after 3 years. Administrators have also discussed the implementation of a Tech Prep option for returning adults, labeled "fast track apprenticeship." These adults are pursuing various occupations (metals, logistics, IT, electronics, or manufacturing). The college's fast-track option, however, may not meet industry needs or provide students with viable occupations. Apparently, thus far, students who have finished the program have not had an advantage in terms of hiring within the industry, though students were guaranteed an interview with companies.

Articulation. Historically, this consortium's emphasis on articulation has been modest. Articulation agreements existed prior to Tech Prep, but they were not used. Since Tech Prep began to be implemented, the community college has continued to limit the number of credits to six articulated-enrollment credits, which may represent too modest an incentive for students to become engaged. The introduction of Education-To-Career (ETC), the state's approach to School-to-Work (STW), and the deliberate merging of the two initiatives of Tech Prep and ETC have streamlined resources and aligned them with state-recommended career clusters. Local leaders realized early on that articulation agreements and course sequencing did not always guarantee the successful transition of students from one course to another, or from the secondary to postsecondary levels, even though articulation was an essential element of the Tech Prep program. Even so, concern about losing instructional units (IUs) is an overriding issue for the community college, resulting in discouragement of an expansion of articulated credits.

The feeling that articulation has missed the mark is prevalent among local leaders, though a few claim articulation agreements are on the rise. Unfortunately, without an adequate student tracking system, local leaders are unsure about whether students are using articulated credits toward the completion of college degrees. Some local leaders estimate that about half of AVC students who enroll at the community college access articulated credits, and they support an expansion of articulation to a broader population. Others recommend revamping the old articulation agreements in favor of dual-credit courses that reward students immediately with earned college credits, but these types of agreements have been slow to surface. Also, some guidance counselors have expressed concerns that articulation should not be focused exclusively on AVC courses, but rather should align academic courses between high schools and colleges to better prepare students for higher learning.

The Role of the Community College. In addition to shifting relationships among the local business and industry stakeholders, the community college itself has undergone considerable change that has impacted the Tech Prep initiative. In short, since 1998 the community college has experienced the loss of several committed advocates of Tech Prep who have retired or

moved on to other positions, including the college's president, deans, and the local Tech Prep director. At the time of our visit in late fall 2000, the new Tech Prep leadership team had not yet recovered from these personnel changes, which created difficulties for the youth apprenticeship program, as new persons in charge of apprentices entered the relationship with less history. New people have also encouraged a reexamination of existing curriculum, which has further complicated matters. One consistent notion was the desire to continue to nurture partnerships with business and industry, and to develop better collaboration between the secondary and postsecondary levels. New leaders appeared firmly committed to these goals because collaboration has been a fundamental part of implementation of Tech Prep in this consortium historically. By the mid-1990s, the community college had collaborated with the high schools, the AVC, and business and industry representatives, to create 25 Tech Prep programs of study in eight career areas. Collaborative efforts among administrators, faculty, and business and industry representatives resulted in curriculum changes at the postsecondary level. Primary stakeholders attributed successes to strong relationships between the community college, the high schools, and business and industry. Most central was the active involvement and support of business and industry, giving teeth to the initiative.

Education-To-Careers (ETC). Recognizing the centrality of collaboration in this region, it is important to point out that the local ETC (Education-to-Career) initiative has been perceived widely to draw attention away from Tech Prep, to complicate its goals and essential features, and to slow its evolution. The new Tech Prep consortium director described Tech Prep and ETC as having important similarities on a conceptual level, but different and competing demands on the ground, at the level of everyday practice. Quite simply, even in a relatively small consortium made up of mostly rural communities, it was unworkable for a small group of people to meet the demands of both programs. The consortium director commented on the lack of understanding that various stakeholders (schools, businesses, the community college) have for the complexity of operating Tech Prep and ETC in tandem, and about the inconsistencies both initiatives have with the region's historic plans for workforce development. Referring to a decade-old initiative called Workforce Challenge, the consortium director commented:

The Partnership did not understand the differences [between Tech Prep and ETC] and had the same three people doing both. I also think the East Central Partnership tried to make the ETC/Tech Prep combination the successor to its Workforce Challenge program without understanding the state board's intent for ETC or even Tech Prep. That is understandable. For 2 years, ETC was the focus; Tech Prep was the 'back burner'; and the state board encouraged the two to be synonymous. When the Partnership conducted its ETC meetings, it thought its Tech Prep work was accomplished.

Identification and Tracking of Tech Prep Participants. This consortium has traditionally identified and tracked Tech Prep participants separately from youth apprentices. In 1998, the state of Illinois began modifying the data management system to accommodate participation in ETC and WBL activities. The new information management system, Illinois Student Identification System (ISIS), began to identify Tech Prep students who had participated in a range of CTE courses and WBL experiences. The community college began publishing follow-up reports about Tech Prep students from all feeder high schools in 1996-97, and high school

counselors were responsible for conducting interest inventories and assessments that fed into the system to identify potential students participants at the secondary level.

Assessment continues to be an important component of this consortium. Since 1997, all secondary and postsecondary personnel are trained and tested on WorkKeys, a primary assessment tool used by the community college's Business and Economic Institute Division to assess employability skills of job applicants and trainees. Yet, a problem identified with assessment is that the ISIS data are rather outdated, and need to be renewed. With Perkins III and a clear focus on outcome assessment, the consortium is making future plans for outcomes assessment. No specific plans have emerged, but it appears the ACT WorkKeys will become an important tool. The consortium continues to use assessment tools like the ACT WorkKeys, and graduates of the community college score above the national average on this test. Secondary students are encouraged to take at least one form of the assessment test before leaving school, and especially high school seniors are encouraged to take the workplace skills test, but not all students do so.

Contributors to Change

The East Central consortium has undoubtedly undergone significant challenges to its Tech Prep program since passage of Perkins III. When we consider the possible reasons for these changes, it is impossible to avoid the partnership relations between the community college, the secondary schools, the AVC, and local business and industry. If we can understand what has occurred in this milieu, we may find reasons for the observed changes.

First, business and industry has found reasons to reevaluate its former relationship with the educational partners, and has expressed these reasons in a variety of ways. Some businesses have pulled out of the relationship for economic reasons, attempting to optimize financial circumstances by reducing their participation in Tech Prep, which is considered peripheral to core operations. Local consortium leaders view a softening of business support for Tech Prep as confirmation that public education is not a top priority. They conclude that business and industry wants the shortest possible training time. They also argue that businesses do not allow students who have participated in the youth apprenticeship program to become involved in highly skilled work, and that they do not seek advanced academic competencies on a consistent basis. Moreover, in the many years since Tech Prep was first implemented, business has not guaranteed positions for Tech Prep graduates, as was anticipated by educators at the start. Indeed, these weaknesses in the youth apprentice model may be its ultimate nemesis. Recently local leaders have been told that, if the youth apprenticeship model is not strengthened to include elements required of the federal Department of Labor (DoL) apprenticeship certification, it will have a difficult time surviving.

Recognizing these challenges, educational leaders of this consortium should be commended for the comparatively positive way in which they have responded to the waning of business support. They continue to seek out new businesses for the youth apprenticeship program, as well as in other newly conceived WBL experiences, such as job shadowing and career academies. But the serious ramifications of an unstable education-business partnership structure may continue to

be felt for some time. If the youth apprenticeship program is to continue to be the flagship of Tech Prep by providing students with quality, skill-centered WBL experiences, a redefinition of purpose, a renewed infusion of resources, and restructuring of curricula is needed.

Observed shifts in education-business partnerships may also result from fundamental differences in how business and education leaders view the goals of schooling. Educators believe that business and industry has not been completely satisfied with the curricular offerings of the consortium. Some of this dissatisfaction seems to derive from the fact that business is impatient and unwilling to support the apprenticeship completers, in whose preparation business and industry has played an integral role. However, there are valid questions about whether the consortium has explored curricular solutions sufficiently enough. In particular, some discussion has occurred regarding the consortium's conscious patterning after the German model of education and training. This model was advocated by an influential business leader, along with the former community college president. Together, these two led a tour of educators and business persons to several German educational sites. They returned to champion implementation of ideas gained during the tour, and their leadership in doing so was praised widely. But within a few years of the tour, both individuals retired, taking their deep knowledge and commitment to the German model with them. To complicate matters further, other key leaders (the AVC director, local CTE regional director, Chamber of Commerce director, and community college lead technology chair) left the area or retired. The new Tech Prep director observed, "No one was available to make sure that everything that needed to get done was getting done." Insufficient fiscal resources, including inadequate compensation, was a major factor given by individuals exiting jobs in the region. Without question, the simultaneous departure of so many key leaders had a destructive impact on Tech Prep implementation.

Personnel turnover in the schools and community college was another contributor to change in this consortium. New faculty members bring with them new ideas and preferences, and new curriculum. Some high schools noted that new teachers had not received professional development in applied teaching methods, so integration at the classroom level had declined as experienced and knowledgeable teachers left the area. Fiscal resources to support Tech Prep—or the lack of them—were noted as an important root cause of decline. Time is another consideration, as curriculum change requires a lot of any faculty, particularly new faculty who are adjusting to a new school culture and community. Even more significant to the future of Tech Prep was the loss of devoted building-level champions who had shown commitment to charting a future for Tech Prep, especially the youth apprenticeship program. Particularly building-level principals who were successful at bringing along reluctant or recalcitrant school personnel were missed. When these school leaders took new positions, the foundation for Tech Prep degenerated substantially.

At the same time, the consortium shows strengths that reflect improving components of Tech Prep. First is the increasing integration of curriculum through the academy model, which may be one of the most important aspects of the local reform in future years. This model seems to overcome some of the difficulties that have plagued Tech Prep because of a lack of cooperation and interdisciplinary curriculum involving the AVC and feeder high schools. At the secondary level, there are positive consistencies in Tech Prep when academies are adopted. Several people

noted the emergence of school-level Tech Prep faculty committees, which have the added benefit of mixing experienced and novice teachers, and of creating new champions to replace those who have moved out of the system. Others noted the continuing value of job shadowing, which is integral to the academy model, as a way of encouraging students to transition into the postsecondary level. Indeed, job shadowing does not appear to have suffered from the changes in education-business relationships as apprenticeships have, but rather have grown and strengthened over time. Finally, academies and career pathways are seen as an increasingly valuable models that may fortify curriculum through improved articulation policies and practices that also enhance student transition to college.

The role of new legislation has not yet come to its full fruition, according to local leaders. Although Perkins III is likely to impact the consortium's outcomes assessment practices, change may not be forthcoming until new personnel settle into their leadership roles. New attention to assessment is thought to impact how the consortium meets the needs of business and industry. The factors notwithstanding, leaders of the East Central consortium do not perceive that Perkins III has created major changes in the region's Tech Prep initiative. Of much greater importance have been changes in personnel and education-business relationships, complicated by larger economic factors that are difficult for business or education leaders to control.

Metropolitan Consortium

Introduction

A primary goal of the Metro consortium is committed to achieving increased student access to and awareness of technical education and careers. This consortium has sought to increase the quality of technical education by extending its influence and coordinating among various educational and private-sector stakeholders in the region to provide a comprehensive and integrated program. It has encouraged students to advance to postsecondary education and to earn associate degrees by linking the curriculum from grade 11 to grade 14. Generally, the consortium has sought to increase collaboration between secondary and postsecondary educational institutions and industry in order to educate and place qualified technicians more effectively.

Finally, the consortium has placed a high priority on the transition of students from high school to college and the retention of students throughout the entire educational experience. Tech Prep is a primary vehicle used by the consortium to meet this goal through the execution of five basic components: applied and integrated curriculum, transition activities, work-based learning (WBL) experiences, career guidance activities, and professional development activities for high school teachers and college faculty and staff.

Major Changes

To understand changes occurring in this consortium since 1998, we interviewed many stakeholders at both the secondary and postsecondary levels. From the perspective of some local leaders, there is a growing commitment to Tech Prep in many secondary schools in the

consortium, and this commitment is blossoming into new opportunities to strengthen programs and engage students in needed services that Tech Prep programs deliver. On the other hand, other leaders believe that commitment to Tech Prep at the upper levels of administration is waning, making it difficult to sustain the quality of programs at the local level. Still, some schools have continued their programs, and the commitment of administrators and teachers remains strong. The uncertainty of funding is postulated to be a major contributor to the variation of commitment across secondary schools in the consortium.

Other changes are evident in the Metro consortium as well. Tech prep has impacted student testing and has led to an integrated approach to teaching that has increased student performance on tests. Some, such as Metro College's engineering technology program, accept credits for CISCO and Computer Systems, and this policy has encouraged secondary students to remain engaged at the postsecondary level. With respect to academics and teaching, the impact of the statewide high school academic testing program has been significant, especially because Tech Prep has always focused on academics in this consortium. Tech prep has helped to foster increased academic standards in the curriculum through various approaches.

Specifically, since 1998-99, several changes have come about in primary features of Tech Prep, including integration, curriculum development, and technology. The underlying causes for many of these identified changes seem to be rooted in financial and political issues at the consortium, as resources dwindle, and as administrators work to allocate remaining dollars to the most effective programs. For example, staff development, once a centerpiece of this consortium's Tech Prep efforts, has suffered from reduced funding, which has in turn impacted the ability of the Tech Prep programs to contribute to building capacity in schools.

Curriculum Development. Tech prep curriculum development has traditionally been a part of professional development activities for secondary schools because the majority of Tech Prep students have been recruited initially at the high school level. Faculty plays a key role in curriculum development as the consortium continues to integrate its academic and CTE curriculum. As was mentioned previously, professional development has been central to the development and implementation of integrated curriculum in this consortium historically, giving consortium leaders confidence that they still have a fighting chance to institute Tech Prep for the long term.

The state's Department of Education facilitates curriculum development by coordinating secondary and postsecondary efforts. Curriculum development, therefore, relies heavily on the collaboration of high school faculty and staff, under the leadership of local personnel, such as Tech Prep coordinators. Several workshops devoted to curriculum development have been led by a Tech Prep coordinator from one of the consortium high schools who serves as project director for a National Science Foundation (NSF) program dealing with urban math, science, and technology. The development and implementation of curriculum has been expanding since 1998, and is reflected in the numerous workshops and institutes conducted by consortium leaders, including the Great Thinkers courses, the benchmarking project with local university professors, and the consortium's long-term participation with the National Centers for Career and Technical Education (NCCTE), beginning with the Urban Schools Network of the National Center for

Research in Vocational Education (NCRVE). In fact, curriculum development continues to progress, as Metro College continues to upgrade curriculum that is articulated with the high schools. The project has focused its efforts in this area on developing web-based curriculum in an effort to maximize dissemination and usage. An example of these developments includes expansion of the Great Thinkers math and science curriculum, including specific units designed to prepare students for state tests.

Transition to College. Transition activities appear to be centered around the College Now program that offers opportunities for students to transition to college. The Tech Prep and School-to-Work educational reforms have both contributed to this outcome with a strong emphasis on integrated curriculum and instruction, rather than applied academics curriculum that is perceived as less rigorous than standard academic instruction. Throughout this consortium, there is a pervasive concern that applied learning is not comparable in rigor and quality to traditional academic curriculum, potentially limiting students' ability to continue to postsecondary education. As a result, new applied learning standards, issued on January 1, 2002, through the regional college and university system, are intended to ensure that Tech Prep provides reasonable opportunities for students to transition to college.

Work-Based Learning. This consortium seeks to expand work-based learning, opening up the 11th- and 12-grade years to more work- and school-based learning (project-based) situations. The work-based learning component also appears in specific programs at the college level. Another college in the region, for instance, offers a Tech Prep autoCAD™ robotics program through the regional vocational education administrative district, which provides students with work-based learning experiences, together with hands-on discovery application, interdisciplinary teamwork, and collaborative experiences with other schools on project-based approaches. Another example is Discovery Island, which provides high school students with month-long labs. It also offers a summer institute that includes 2 weeks of science coursework, followed by 2 weeks with college professors in a work-based learning environment. This program offers students both sciencelab credit and work experience.

Career Guidance. The Metro consortium continues to be committed to conducting various career guidance activities. It sponsors a Tech Prep club in which students discuss career-related and academic issues. It also provides students with an opportunity to meet professionals in their related fields, and to communicate with them regularly over an extended period of time. Students visit college campuses, hospitals, and offices, and meet professionals in their career fields as a part of their involvement in the club.

Career counseling is offered to seniors, and students can receive training on the Internet to prepare them for job searches and writing resumes. Additionally, participants in Tech Prep are encouraged to engage in regular contact with mentors by means of a tele-mentoring program, and those Tech Prep students who attend Metro College can participate in a college-based enterprise that provides internships for students in mechanical and electromechanical engineering technology.

Professional Development. Professional development activities in this consortium have traditionally targeted high school teachers, counselors, and administrators. The consortium has

taken on more responsibility for professional development activities for the faculty and staff of Metro College, as more students matriculate to the postsecondary level. Essentially, the consortium has relied on three kinds of professional development activities: workshops and institutes, year-long pilot projects, and special projects.

At one high school, professional development is a particularly important goal. Administrators at this school seek to use technology as a teaching tool, and make sure that all staff will be computer literate. The school provides on-site professional development by outside university staff in the classroom. School administrators and their community and business and industry partners seek continued funding for professional development through the state. This school also encourages staff to engage in externships, and to visit programs that can serve as models for "techno-based interdisciplinary project-based learning environments, according to one local Tech Prep consortium leader.

A key point is that the teachers in academic subject areas in the secondary school are able to provide academic and technical curriculum integration, and are better able to assess student performance in academic and technical activities. These teachers and staff members serve as "turnkeys" for continuing professional and staff development in these areas. This approach relies very much on teacher collaboration among an increasingly wider range of faculty across departments. The hope is that classrooms will become integrated through "shared assignments, discussions, and demonstrations." Staff development workshops are being created within the context of integrated, interdisciplinary curriculum development to reinforce the important principles of integration and collaboration. One result of this approach is a rich environment in which professional teaching skills and technology blend to enhance teaching and learning throughout the entire school.

One storm cloud on the horizon, however, is the diminishing funding available for professional development. Though less funding is available to support professional development, some schools make public the experience and background of their teachers in order to attract attention to their accomplishments. Linkages have been established with the local Education Development Center (EDC), and school administrators seek to establish strategic partnerships with private foundations that support reforms in the schools locally. Moreover, professional development has been improved with the introduction of a professional development lab, which is an innovation designed to provide faculty with an intensive professional development experience.

Most schools are supplemented with the College Now program, in association with the regional college system. This program is funded by a Department of Education staff development contract that supports a team consisting of three to five teachers from academic and technical fields in each school having Tech Prep programs. The college faculty is involved in training, and making visits to high school faculty. Funding for this program provides for tuition costs of high school teachers. College Now also provides high school students with college credits, and it facilitates students' opportunities to transition to the postsecondary level.

Beginning in 1999–00, the Tech Prep office received funding through the Board of Education to support staff development and has used this, along with Tech Prep funds, to conduct annual staff development institutes for teachers in Tech Prep schools. Each follows a similar format: teams of teachers representing appropriate academic and technical areas meet for five days to develop standards-based and integrated curriculum, and to develop web pages to post the units. Two institutes have been completed, and the themes have been integrated academic and technology and English Language Arts test preparation. In 2001–02, the group will begin in April to develop the project's math based units that are posted on the consortium's web site.

Academic Course Standards. Class size has become a major issue impacting increased academic standards. The consortium considers 22 students per teacher as optimal, but the current 34 to 35 students represent an overcrowded situation. Schools would like to reduce class size from 24 to 20, but funding for such a cut is not available. Given these circumstances, it has been difficult for schools to develop a plan that is acceptable to administration. Classrooms are "maxed out" at 34 students. It appears, however, that increasing academic standards may eventually help schools achieve more optimal classroom sizes.

The consortium continues to push for increasing standards, especially among students who require remediation. The science department in one secondary school seeks funding to support remediation in science. Remediation and the reduction of class sizes are seen as two ways that academic standards can be increased at the same time that retention of students can be increased. Based on local evaluation evidence, Tech Prep students tend to have fewer disciplinary problems and are not suspended as much as other students; attendance is also much better.

Enhancing Access and Opportunities. Access to technology stands at the center of this consortium's goals and thinking about access and opportunities for students. The primary goals of one high school for access and equity include that every student and staff member has access to necessary technology, and that this access will lead to knowledge sharing and meeting the needs of the future. This school has set the strategic goal to partner with several organizations in order to enhance access and equity for its students, including corporations such as MCI World Com, Securities Industry Automation Corporation, IBM Learning Village, and Copernicus Interactive. This school is the process of reallocating its resources to provide for computer networking and Internet access via dedicated communication lines. Science and technology centers, multimedia/library centers, and classrooms are being upgraded with new computer hardware and software.

Beyond the impressive technology enhancements occurring in high schools having a long-standing association with Tech Prep, this consortium has made a dedicated effort to work with additional high schools that have not heretofore been involved. The local consortium coordinator explained that, as changes in school administration and other challenges have occurred within schools in her region, she has made a concerted effort to create relationships with those distressed schools and introduce the new administration and faculty to key Tech Prep concepts. Her goal is to find ways to reach more students in the region and capitalize on opportunities for those students to engage in enhanced academic and technical instruction at the secondary level so they are better prepared to make a successful transition to college. The consortium coordinator is

highly motivated to recruit these students because she believes that many of them would not be prepared for college if Tech Prep and the transition-to-college services provided by her consortium office were not available.

Curriculum Integration and Articulation. With its commitment to curriculum integration as a centerpiece, the Metro consortium is best described as using an integrated Tech Prep approach. Curriculum integration has not been an easy accomplishment, as the faculty has tried to balance traditional academics with the career-related demands made on academic courses by Tech Prep. Balance has been critical. This consortium has sought and found balance using three primary approaches to integrating academic and vocational curriculum: infusion of academic content into vocational-technical courses; development of applied academics as within courses; and interdisciplinary courses with project-based assessments. Two examples worth mentioning of the later strategies that continue in this consortium from earlier years include the "Model Cities" and the "Great Thinkers in Science" courses, both of which have served as prototypes for other interdisciplinary courses developed by this consortium.

Curriculum integration, like the more fundamental curriculum development that under-girds it, is driven by faculty involvement, and therefore, it is related to professional development. It is a fundamental part of the vision of a few of the more progressive and innovative secondary schools in the consortium. For example, to facilitate further curriculum integration efforts, one secondary school began to implement block scheduling, though there was some resistance because people were not familiar with it. Another obstacle was that not enough teachers became involved beyond the ninth grade. Another was that some of the traditional vocational "shop" programs opposed it because of changes to scheduling, but support does exist for the concept from school administration because it allows common planning time and externships.

By the fall of 2000, one high school in the consortium established three new academies that focus on aspects of information technology, and that incorporate new aspects of computer technology innovations into their instructional programs. This school advertises its integrated programs to parents as one of its primary selling points. Another high school offers health occupations programs in nursing, dental, business, and pre-medical, which are similarly technologically innovative and integrated. In both cases, there is significant parental and community support for these programs.

Tech prep continues to emphasize a 2+2 or 2+2+2 articulated curriculum in technical areas, focusing on high school students as juniors and/or seniors who complete math and English courses designated as part of the Tech Prep program, in addition to their career-technical courses. Specifically, an institute of technology exists at this high school, and it emphasizes an information-technology cluster developed with support of the federal OVAE. This program provides increased skill standards and on-line professional development.

Technology Enhancements. The consortium emphasizes the integration of technology into daily lesson plans. One high school has implemented a goal to invigorate and equip its curriculum with integrated technology-based curriculum, managed through block-program student scheduling. Block scheduling, among other things, allows the use of technology in integrated lesson plans. This new approach to integration of technology has been in the works

since 1999, when a new school computer network was implemented. Computer training was provided for all teachers and staff, and resources were allocated for computer networking to provide in-school computer users with Internet access. Furthermore, teams were formed to continue planning around the implementation of the school's technology master plan. Thus, in the first year of the overall timeline, the school put into place much of the hardware, and some of the training and organization, involved in increasing the implementation and integration of technology.

In the 2000-01 academic year, further organizational changes were put into place. The "house" plan was implemented, together with further professional development activities, and evaluation and outcomes assessment. Houses are organized by grades, and include block programming of academic courses. To date, the plan is being phased in and is now in place in grades 9 and 10. In addition, the technical curriculum has been broadened so that core courses are offered in grades 9 and 10; further specialization will occur in grades 11 and 12. In the 3rd year of planning, 2001-02, the school will continue team building, assessment, and professional development activities. It will also receive on- and off-site assistance from partners. Although much effort will be expended on these activities, the core of this new initiative is redesigning a technology infrastructure that will impact 30 school rooms and network more than 400 personal computer workstations. Each classroom so affected will be equipped with servers, printers, and security cameras, as well as card-reader-controlled doors. The total cost of this improvement will be in excess of \$3.5 million, with a proposed annual maintenance cost of more than \$550,000.

Contributors to Change

Since its initial implementation, the Metro Consortium has embraced an aggressive set of goals directed at enhancing student success in transitioning from high school to college, with particular attention to preparation for technical occupations. One goal is to increase high school student awareness of and access to academic and technical education and technical centers in the region. Clearly, this goal remains a high priority for the consortium, and is evidenced in new initiatives to reach out to additional high schools and to infuse technology into curriculum for students and professional development opportunities for faculty.

The extent of the incorporation of the Internet and educational technology to accomplish curriculum reform and professional development has been unique in this consortium as compared to others in the CC&B study. One reason for the consortium's high utilization of technology is the wealth of expertise and interest among various personnel in the region, leading to the successful acquisition of external funding from agencies such as NSF and the state's Department of Education. In addition to funding, success is nurtured as a result of an underlying appreciation for technology as a means of enhancing access to ideas. Far from zealots, local educational leaders show a fundamental understanding that technology can be a ticket to a better way of life for students, and a window to a larger world for secondary teachers and college faculty alike. Among educational professionals, utilizing the web to engage in shared curriculum development (integration) and to disseminate ideas across the disciplines and levels of education makes new ideas associated with Tech Prep known to the entire educational community and also to the public.

Countering the progress made by committed schools and the increased use of technology to disseminate ideas to students and faculty is the issue of turnover of educational administrators, particularly at the high school level. In one school in particular, innovative curriculum changes made over a period of several years nearly came undone when the district's central administration moved key members of the existing administration out, replacing it with new administrators having little knowledge of or appreciation for Tech Prep. Pressure was placed on teachers within the school to conform to a set of ideas espoused by the new school leadership (and possibly also by central administration), and these circumstances made it difficult for teachers to proceed with earlier plans for the Tech Prep program. Consequently, teacher participation waned and student enrollments dropped because students could no longer get the full complement of courses to support their Tech Prep programs of study.

Without doubt, administrative changes can play an important role in sustaining or dismantling change, but so too can uncertainty about funding. Financial resources are always problematic in a consortium that is as aggressive as this one. Although the consortium continues to be successful in securing financial resources from the state and other sources, including federal agencies and private-sector contributors, a constant uncertainty about future funding hampers long-term planning efforts. On the positive side, the consortium leadership works closely with the regional CTE office to align Perkins and Tech Prep funding so that mutually beneficial goals can be met. In fact, the consortium director's knowledge of a wide range of funding sources is impressive, allowing her to pull together people and financial resources to meet common goals on behalf of the universal goal of meeting student needs.

Another major contributor to change in this consortium has come about through the central role played by curriculum development and professional development of teachers at mostly the secondary, but also the postsecondary, levels. With respect to this point, we noted in our 1999 report that,

By targeting much of the Tech Prep grant funds for professional development for teachers, and, most importantly, by following up and creating the conditions for teachers to apply the new knowledge and skills to curriculum development, the consortium has made steady progress. Professional development has been the key to curriculum development, giving consortium leaders confidence that they have a fighting chance at institutionalizing Tech Prep for the long term. Having committed leaders and involved teachers willing to engage in curriculum reform has been absolutely key for Tech Prep to take root in this consortium. (Bragg et al., 1999, p. 55)

Throughout, consortium leaders have held a fundamental belief that the best way for real change to come about for students is to invest in teachers. By refocusing and enhancing vital aspects of the curriculum, a small group of teachers could make teaching and learning a fundamentally different experience for students, and then they could advocate for curriculum change across the whole curriculum. Other teachers would hear about the reforms and want to be a part of them. To achieve this goal, a cultural change was needed; financial resources and technical assistance was provided by the Tech Prep consortium office so that change could take place. On the surface, it was a simple strategy, but on a deeper and more fundamental level, it

was highly complex. Implementation challenges were evident at every turn, but through a steadfast commitment to teachers as change agents by the consortium's leaders, the vision that Tech Prep could be a powerful vehicle to enhance student success was realized. A willingness to collaborate, build partnerships, utilize talented people, and capitalize on good ideas has contributed to the consortium's basic goal of helping students make the transition to college and prepare for a more highly technological world.

Hillsborough Tech Prep Consortium

Introduction

A major goal of the Hillsborough Tech Prep consortium (http://apps.sdhc.k12.fl.us/sdhc/tca/Newsletters/tech_prep_fact_sheet.pdf), located in Hillsborough County, FL, has centered on improving and creating education and work opportunities for the neglected majority. One of the consortium's most important original goals was the replacement of the general track with applied curriculum and Tech Prep. In fact, the consortium created various pathways for Tech Prep, including one that integrated Tech Prep with College Prep to create a College Tech Prep approach that combined a technical course of study with a foreign language.

A long-standing goal of Tech Prep has been to increase the number of business partners without overtaxing relations with any one business. In recent years, the participation of business and industry has been focused on increasing apprenticeship programs in electricity and trades plumbing, creating integrated and contextual curriculum, and providing WBL experiences. Business and industry have helped with the implementation of more industry skill sets for portable credentials such as the certified nurse assistant, and have participated in academies that have grown in importance in this consortium. Also, business and industry have contributed historically to the training of faculty and counselors and to an increased emphasis on career awareness for students from the elementary grades through the community college level.

Major Changes

Articulation. Historically, the Hillsborough consortium focused little articulation at the college level prior to its implementation of Tech Prep and School-to-Work (STW). Subsequent to Perkins II, the consortium developed into a 4+2 approach, with some 4+2+2, since some community-college degree programs articulated to 4-year universities. Dual enrollment or time-shortened enrollment have been primary ways for students to access articulated courses with technical courses being articulated on a course-to-course basis.

At the high school level, the emphasis has been on articulation opportunities available to Tech Prep program completers. Tech Prep graduates have had scholarships available to assist them to transition to the community college. Articulation at this site, as noted in our preliminary report (Bragg et al., 1999), was somewhat hindered by the inclusion of an intermediary articulation stage from the high schools to the adult technical centers. The number of articulated programs grew to a high point of 31 in 1996, but fell thereafter. Part of the reason for the decline was state-imposed program lengths that forced community colleges to eliminate elective credits,

reducing the number of articulated courses, and thus reducing the number of articulation agreements among the high schools, adult technical centers, and community colleges.

The consortium continues to cite articulation as one of its program strengths, noting that most CTE courses are articulated. However, it is apparent from our interviews with educational leaders at the community college, that articulation is not considered fully implemented. Some difficulties occur in articulation of certain CTE programs to the community college, such as interior design. The reason is that the community college sees itself primarily as a transfer college, downplaying emphasis on articulation agreements of CTE courses with the secondary schools and adult technical centers. The articulation officer reinforced this perspective when she boasted that the college has a high transfer rate, though the precise transfer rate was unknown.

During our earlier interviews in 1998–99, it was widely thought that students did not take advantage of articulated courses to continue in Tech Prep programs at the college level, and it is difficult to say whether and to what degree this situation continues to exist. Clearly, high school students are taking secondary courses that qualify them for college credit, and they are applying for college scholarships at the end of their senior year. Even so, the consortium has no method to track college credit generation among matriculating students, and even students' scholarships are often not renewed, suggesting they are not a strong incentive to retain students in the Tech Prep program at the postsecondary level.

Since 1997, the consortium has defined dual enrollment as a priority, especially because of the issue of whether the community college will receive funding for occupational completers who articulate. Dual enrollment is utilized as early as the 10th grade, and students who engage in dual enrollment have been encouraged to take the college placement test (CPT). If they do not pass the CPT or do not test high enough to enter the dual enrollment program, they enter a remedial program. This consortium has a remediation committee that organizes activities, such as college-readiness camps and Think Camps, which prepare eighth graders to take the SAT. The PSAT is also used to identify students who need extra attention and remediation before reaching more advanced levels of school.

The community college maintains an open-door policy that includes students on special status, such as early admission, co-enrollment, and dual enrollment. Despite this open door policy, the number of Tech Prep students who participate in dual enrollment in the last 2 years has dropped. An explanation for the decline in numbers may be that Tech Prep students want dual enrollment in English and math more than CTE. Other problems for the community college surrounding dual enrollment include faculty struggles, dealing with unruly high school students on campus, and balancing the rights and choices of parents and students with the need to provide students with a quality education. Community college instructors have explained that they are not prepared to deal with the kinds of discipline problems and parental demands that are commonplace among high school students.

Another important factor impacting articulation appears to be a lack of understanding among community college faculty about what is happening with curriculum reform at the high school level, and why. Apparently, community college faculty do not understand why state curriculum standards demand that certain courses, such as English literature, are required at the secondary

level. Left unresolved, college teachers do not seem to understand the boundaries between the community college and the high school curricula. Breakdowns in communication between secondary and postsecondary educators are detrimental to articulation between the community college and the high schools. Combined with the rapid growth in the demand for adult workforce training and certification, some community college administrators and faculty question the priorities Tech Prep should maintain in their curriculum. Confusion about what needs to be taught, and effective ways to deal with younger students and their parents, along with increasing demand for workforce training for non-traditional students, diminish the interest and capacity of the community college to support the Tech Prep program.

Integrated Curriculum. Recognition of the need for integrated curriculum occurs at the secondary and postsecondary levels, though this was not always the case, in practice. Despite support from the district-level CTE administrators, the notion of curriculum integration faced early resistance from the academic faculty. In this consortium, curriculum integration has focused on language arts, health, engineering, and culinary arts, but has also come to include science, math, agribusiness, and desktop publishing. Integration has been more successful for math and English, especially at the community college. The technical faculty at the college have found it difficult to integrate applied components, and relied on collaboration more than structural changes, including team teaching. Also, a recent decision by the college has resulted in the formation of a committee to develop a 1-credit-hour capstone course as a graduation requirement for Tech Prep programs. The course will be generic and interdisciplinary, offering the same learning objectives for all disciplines.

Consortium leaders have noted that since 1998, the reliance on applied academics has been in a downward trend in this consortium, and is gradually being replaced by standard academic courses supplemented with contextual teaching and learning strategies. In fact, standards-based curriculum is currently thought to be the best means for integrating academic and technical content. In math, curriculum is developed that teaches students to implement applied concepts in actual workplace scenarios. Breadth and rigor of curriculum continues to be an important concern of secondary educators in the consortium.

An example of standards-based curriculum that is associated with certification is the Pro-Start culinary arts curriculum available in the district. It is a 2-year high school program that complements the food production program. It offers a Pro-Start credential, a recognized certificate within the hospitality industry, from the National Restaurant Association (NRA). The curriculum is produced through the NRA educational foundation, and is written by education professionals. It offers a complete 2-year curriculum, with books and student assessments. There is also a lab experience, and 400 hours of paid mentorship. Although Tech Prep leaders consider the program to be difficult to manage logistically, hospitality students who go through this program are encouraged to see college as a real possibility, including those who are at-risk for dropping out.

No doubt the number of certificates issued by secondary and postsecondary institutions have increased since 1998. This seems to be a major change connected to the labor market and the proliferation of industry-specific certificates. This change stands out because our preliminary

report made no mention of occupational certification only of academic certificates awarded to students in postsecondary CTE programs. For example, the report mentions that the definition of a Tech Prep student is one who is enrolled in a technical component leading to a minimum of a 2-year postsecondary certificate or degree. More specific information about the number of new certificate programs and enrollments in those programs was not available. However, there seemed to be a general understanding that more certificates were awarded in many more occupational areas.

Career Clusters and Academies. The academy model is one of the predominant Tech Prep approaches in this consortium. The first academy appeared in 1990 in one high school in the district, where the academy model has continued to be one of the strongest aspects of curriculum integration; academies are mentioned in several contexts in our recent interviews. In this consortium, career academies and career clusters first took root in a technical high school, and were used to organize an integrated curricular approach. Career academies have provided students with a variety of WBL experiences, including internships and job shadowing experiences.

Since its beginning, the academy model has burgeoned to the point that career academies have expanded from one school into several others. At present, two categories of academy are recognized: a true model, and a hybrid model. The school-within-a-school (SWIS) approach represents a "true" academy. The one SWIS is also a College Tech Prep (CTP) magnet program that operates somewhat independently from the rest of the Tech Prep and CTE offerings because of its unique goals and strategies. One such program serves about 150 students. Interestingly, even though the program utilizes a CTP model, it purports to accept all student applicants. A committee of faculty from the academic and CTE areas as well as guidance counselors, oversee this academy.

A hybrid academy, on the other hand, is integrated into the regular school system, and accepts only identified students from the student body. An example of the hybrid academy is the Aquaculture Academy at a high school located outside the city. Hybrid academies are not always fully integrated, and focus on specific projects that teach students particular skills. The Aquaculture Academy addresses aquatics, and offers a college-bound program representing what local officials call a "hands-on college track." Recruitment is a significant aspect of this academy because a critical mass of students must be in place for the academy to operate. Because students are part of the regular school system, the school relies on block scheduling to bring students together. Though difficult, most student schedules can be aligned with the academy, but it is difficult to set aside time for teachers to engage in common planning. When student schedules are most unworkable is when college prep classes conflict with CTE ones.

Finally, academies emphasize active partnerships between the schools and businesses and industries, which often provide instructors and equipment. In the case of the Aquaculture Academy, the primary partner is Florida Tropical Fish Farms Association, which has provided a phenomenal level of support and resources for the program. In only a few years, students have become highly successful at the fish farming business, as the academy continues to flourish.

Career Development. Historically, this consortium has placed a great deal of attention on career development, beginning at the elementary and middle school levels, and extending into the high school level. Professional development has been offered to counselors across the system to facilitate their knowledge of Tech Prep and career opportunities for youths, targeting students in the middle school through high school levels. Recently, the consortium has developed a camp for 7th-grade girls and their mothers, focusing on IT careers. Tech Prep is a partner with other CTE-related groups, and the initiative is partially funded by Sykes Enterprise. In another instance, a camp is offered for fifth- and sixth-grade middle-school students in partnership with a senior high school, offering students strong counseling relationships along with a magnet school option. Finally, a ninth-grade seminar continues to be available for students through two summer workshops, emphasizing career connections with the high schools in the district.

Role of the Community College. Curriculum integration has been the focus on a pilot project implemented by the nursing program. In this effort, focused on at-risk students, two courses are being integrated to support the movement of more individuals into nursing, which is an occupation that is experiencing serious labor shortages. The curriculum integration emphasizes math and technical reading, wherein students learn how to use the library, manage their time more wisely while also working on developing test-taking skills, and write research papers.

Leaders of the Hillsborough consortium are also developing integrated curriculum in association with learning communities at the college level, at the same time, high schools are replacing applied academics with contextual learning infused into traditional academic courses. At the postsecondary level, learning communities have been formed primarily in academic courses, such as sociology and English. A connection between learning communities and WBL is not particularly strong either, apparently because much of the WBL takes place at the adult technical centers or at the four county area career centers, rather than at the community college where learning communities do exist. Of note, WBL components are built into the college's capstone and master skills projects. But because learning communities are rooted in the academic side of the college rather than the technical, instructors affiliated with the learning communities have been slow to deal with technical subject matter or adopt technology, including a reluctance to use e-mail.

Professional Development. Historically, professional development has been focused on changing the way teachers teach and emphasizing applied academics. Inservice and workshop activities designed to promote applied academics have been a prominent part of professional development since the beginning of Tech Prep in 1991, and have focused on curriculum integration, career awareness, and on teaching thinking, speaking, listening, and reading skills. The target participants of these activities have been faculty in the core areas of science, math, language arts, and CTE, along with guidance counselors and business representatives.

With the move away from applied academics and toward contextual learning, it may be that the thrust of professional development is in a state of change. Professional development continues to revolve primarily around staff development activities, such as conferences and workshops, but the high schools appear to have fewer resources for local staff development workshops, and rely more heavily on supervisors to support them. The Tech Prep coordinator

spoke enthusiastically about her strategy of identifying highly motivated faculty and providing them with resources for professional development, and then asking them to share their new knowledge with others in their schools. She also emphasized a continuing relationship with a nationally-known expert on curriculum integration who resides in her area. Specifically, three middle schools and four high schools have been engaged in professional development that helps integrate the CTE curriculum with Florida's curriculum standards, using CTE teachers as resource persons to ensure the academic courses have a meaningful career focus.

School-to-Work. STW was originally intended to serve as a way to increase the interconnectedness between the academic and work-related aspects of education. The STW initiative sought to establish partnerships with more businesses and industries than Tech Prep. The implementation of STW was originally the consortium's response to the changing nature of the labor market in the region, which demanded more and more highly skilled technical labor. STW legislation was passed in 1994, but the state didn't fund this consortium until 1997, when a comprehensive plan was developed.

The STW initiative has aligned with the objectives of Tech Prep by emphasizing increased academic standards, reducing the dropout rate, and improving WBL opportunities. One way this was accomplished was through a variety of apprenticeships. STW focused primarily on youth apprenticeships that combined integrated coursework with a coordinated, paid, work component. A youth apprentice could ideally become involved in highly skilled work and further education opportunities.

Work-based and school-based cooperative enterprises continued to develop slowly in this consortium. Generally, local partners have shown a lack of interest in and support for youth apprenticeships, but recently there has been a change in this attitude. Some leaders in this consortium, including the dean responsible for CTE programs at the community college, have begun to speak of new initiatives with technical programs and apprenticeships. New state legislation in the last 3 years has begun to promote apprenticeship programs. Tech Prep is positioned to support this change because it is targeted at the student population that will enter apprenticeship programs. It is marketed on two levels: applied science degrees, and preparation for targeted skill sets or apprenticeships.

Currently, however, Tech Prep leaders in this consortium paint a bleak picture of STW because STW-specific funding has ended, and Perkins III funding cannot be spent on STW activities at the K-8 level, where much of the previous effort was devoted. At the local level, most STW coordinators have returned to the classroom and have been integrated back into the faculty. The impression we formed during interviews conducted late in 2000 was that, since money became available in 1997 to implement STW, the initiative had not established plans to extend STW beyond the life of the original grant. We also did not observe that STW was being implemented innovatively to solve deeper educational or economic needs.

Further, STW did not connect with the postsecondary (community college) efforts in ways akin to Tech Prep. STW, in the words of one individual interviewed, "didn't work with anyone." Efforts were undermined because it "did not have a consortium [to provide a support structure]." An exception to this gloomy perspective came from a local educator who observed that

businesses saw more potential in STW than Tech Prep. She claimed that business "didn't understand Tech Prep very well," providing one reason why STW filled a niche as long as grant funds lasted.

Contributors to Change

The contributors to change are multifaceted in this consortium. First, leaders at the community college expressed discontentment with certain aspects of articulation. They suggest it is not streamlined enough, and that students who are participating are perhaps not prepared enough for college-level coursework. It does not appear that mechanisms designed to facilitate articulation, which were thought to yield so much promise in earlier times, such as scholarships, resulted in noteworthy successes in increasing student transition to college.

Second, the academy model has evolved and is apparently spreading throughout the secondary system. Given the noted logistical difficulties of implementing this approach, it is especially important to understand why the academy model has become so popular. It is likely that some of the success is attributable to the efficiency with which the academy model has been employed in the secondary curriculum, as compared to the broader approach associated with Tech Prep. By culling out students and focusing resources exclusively on them, it is possible that student outcomes may be enhanced, though the consortium does not know if student outcomes associated with academies differ from Tech Prep in general. Possibly, also, since the Tech Prep initiative has been slow to bring business and industry stakeholders to the table, academies have filled the void with a heavily school-based approach. No doubt, schools participating in STW activities benefited from their partnerships with business and industry.

Similarly, the expansion of learning communities and the adoption of capstone courses and other curriculum integration models at the postsecondary level may provide similar advantages as secondary-level career academies. It is not readily apparent, however, that the community college's learning communities place much emphasis on Tech Prep or CTE-related curriculum. They do appear to provide positive examples of ways to integrate curriculum, and model exemplary instructional practices (such as team teaching), but their primary emphasis remains in the academic content areas. As such, they miss an opportunity to address the needs of students who desire to enter the workforce with technical skills.

Professional development of faculty has traditionally been focused on encouraging learning through applied academics, but more resources are being directed to off-campus professional development activities, such as conferences and workshops. Another reason that organized professional development efforts may have fallen off is that the consortium has shifted in its teaching emphasis, toward contextual teaching and learning. This seems a powerful rationale for professional development of faculty, and perhaps the consortium stands on the edge of a period of growth in this area, with the continued involvement of a national expert on academic and CTE integration. Professional development of guidance counselors, on the other hand, seems to have leveled off as guidance counselors are continually educated and reeducated about Tech Prep. Funding for this element of Tech Prep has been central to the consortium's goals, and would seem to be necessary for its continued enhancement.

Overall, major changes can be summed up as centering on the availability and distribution of funding; changes in curriculum and instructional practices, including the expansion of career academies and various approaches to curriculum integration; and the increasing connections between the secondary and postsecondary levels. Business and industry, a reliable partner in the STW initiative, has played a low-key role in Tech Prep to this point. However, recent developments in the creation of career academies provide a viable mechanism to enhance the role of business and industry.

Golden Crescent Tech Prep Consortium²

Introduction

Under new leadership and with the support of the dean of workforce education of the lead community college, the Golden Crescent consortium (<http://www.gctechprep.org/>), headquartered in the region's largest town, Victoria, TX, has experienced growth over the last several years, primarily in Tech Prep program offerings. According to the consortium director, Tech Prep has transitioned from a building process, through an expansion process, but now needs to be woven into the fabric of the area secondary schools and community college.

Despite the change in consortium directors in 1998, other key consortium staff have remained constant, lending stability to the leadership-transition process, and continuity in implementation of the consortium's five principal goals, which have remained the same as for the past 4 or 5 years, with increased emphasis on Tech Prep student identification and follow-up. In addition to the continued development of articulated Tech Prep programs and improving student enrollment and completion rates, the consortium continues to promote and provide resources for the reform of educational content and instructional methods through professional development activities and support of the High Schools That Work (HSTW) initiative. The improvement of consortium partnerships among business, industry, and secondary and postsecondary educational institutions remains a high priority, as well as methods to continuously evaluate and improve Tech Prep programs and services.

In addition, organizational changes at both the college and consortium levels have occurred over the past 12 to 18 months, and their potential impact on Tech Prep, if any, is difficult to know. A new dean assumed duties July 1, 2001, and the college had also hired a new dean of instruction who transferred supervision of Tech Prep consortium staff from her office to the dean of workforce education. Effective March 1, 2001, STW funds and activities were severed from the Golden Crescent Tech Prep/School-to-Careers Partnership, transferring staff to the local workforce development board. Under this arrangement, STW was thought to be more efficiently coordinated with other regionally delivered youth services. In the new capacity, STW staff connect more efficiently with the Workforce Investment Act (WIA) youth council, Communities in Schools, and America's Promise to Youth.

² Carrie H. Brown is recognized for her thoughtful and collaborative work with the Golden Crescent Consortium and CC&B research staff since the beginning of this study, including drafting the original report for this consortium.

Major Changes

Continued Growth in Tech Prep Programs. According to the former dean of workforce education, "Tech Prep needs to be continued in its current successful format; most of our technical programs have benefited from the high school/community college pipeline." Tech Prep enrollments have grown from 1998-99 to 2000-01, after experiencing a slight drop in enrollment between 1997-98 and 1998-99 (see Table 3). In fact, what happened during this period was probably a shifting in identification of Tech Prep students to reflect more precise and consistent measures on a consortium-wide basis (reflecting changes in reporting to the state) than an actual change in the number of student participants.

Table 3

Secondary Tech Prep Enrollments in the Golden Crescent Consortium

ISD	1997-98	1998-99	1999-2000	2000-01
1	246	190	413	541
2	235	204	269	140
3	10	7	0	0
4	212	228	218	194
5	0	0	0	159
6	144	182	190	169
7	131	92	56	195
8	102	108	91	87
9	0	0	0	0
10	209	298	279	298
11	106	160	99	186
12	124	131	144	181
13	107	7	70	179
14	0	0	9	0
15	110	79	105	0
16	-	-	-	0
17	-	-	-	46
18	-	-	-	0
19	57	73	97	100
20	1407	911	421	403
Total	3,200	2,670	2,461	2,878

Source: Texas Education Agency, PEIMS

Enrollments at the postsecondary level show an increase between fall 1996 and fall 1997, with enrollments stabilizing at about 3,800 over the period of fall 1997 to fall 1999 (see Table 4).

Table 4

Postsecondary Tech Prep and Total Headcounts in Victoria College

College Enrollment	Fall 1995	Fall 1996	Fall 1997	Fall 1998	Fall 1999
Declared Tech Prep Major	406	391	798	853	740
Total Headcount	3,581	3,531	3,804	3,732	3,800

Source: Texas Higher Education Coordinating Board

Tech Prep program offerings continue to expand, with more articulated courses and credits being accepted by the community college each year. In a fall 2000 state survey, the college's dean of workforce education reported that not only had Tech Prep improved existing technical programs, and increased program enrollment, implementation of Tech Prep resulted in new certificate and degree programs, and expanded education-business partnerships in the region (Brown, 2001). In general, school district staff agreed that program offerings and opportunities for expanded articulation had increased over the last several years.

The consortium was also instrumental in development and support of the first CISCO Networking Academy and Tech Prep program in Texas, providing financing for network testers and software (\$10,000 for equipment necessary for the CISCO Certification Network Professional academy [modules 5-8]), and paying expenses for secondary and postsecondary instructor training, including fees and travel, as well as program advertising. The college CISCO Certified instructor has trained high school teachers to insure consistency in instruction.

Experiencing growth over the last 23 years, the CISCO program is now fully implemented, with nine school districts participating in the articulated curriculum. Participating high schools offer from one to four CISCO modules, depending on their individual scheduling capability, as well as related computer classes. For example, the Wide Area Telecommunications Technology AAS degree contains seven courses offered at high school level for a potential 18 hours of college credit, including 12 hours for CISCO modules 1-4, and 6 additional credit-hours in PC operating system and computer programming. Because the college offers CISCO modules 1-4, as well as modules 5-8, the Tech Prep program model allows college students to pick up whatever modules they did not complete in high school. In addition, cooperative experiences provided by regional business and industry offer capstone experiences for participating college students. According to the CISCO program director at the college, not only has Tech Prep made CISCO possible, there has been "wonderful success with modules 1-4 at the high school," with high school student participants "more motivated" and performing well when they transition to the college.

The second key area of program change resulted from the development of a partnership modeled after a highly successful program in the greater Houston area of the Texas Gulf Coast. The Process Technology Educational Committee (PTEC) represents a partnership between the community college and several major industry leaders such as Alcoa, BP Chemicals, DuPont, Formosa Plastics, and Union Carbide. Formed in response to regional labor market demand for a

projected 60–70 process technicians, process operators, refinery operators, power distribution operators, and chemical plant operators each year at area petrochemical and refining plants, industry donated about \$1.5 million toward a state-of-the-art simulated control room and plant laboratory. Housed at the community college, the Process Operating Technology Tech Prep Program provides needed training sought by participating industries. The program represents an area of potential growth for Tech Prep with entry-level annual salaries of \$28,000–30,000, and an average annual salary of \$56,000.

Despite an existing Tech Prep program articulation model that includes 3 hours of articulated credit in process technology, high schools have been unable to participate so far, primarily because it is difficult to find state-certified high school teachers with petrochemical plant experience. However, a large high school in Victoria was expected to begin offering Introduction to Process Technology in fall 2001. Although college enrollment in the program had been adequate and there was industry support for the program on the postsecondary level, hiring practices continue to reflect the traditional culture of the petrochemical industry. Specifically, the educational level required for employment remains at the high-school diploma level. Also, previous work experience in a plant, often acquired through summer jobs facilitated by family relationships, remains another strong preference for hiring. Thereby, the industry sends a mixed message to the community regarding the need for an AAS degree in Process Operating Technology, urging the development of new educational programs, but continuing historic hiring practices that are not consistent with training.

Other major areas of change include office systems technology, which has experienced additions in articulated course offerings over the last several years, including desktop publishing and business office machines. Existing articulated programs such as electronics and instrumentation have added additional postsecondary options, such as biomedical technology.

For recruitment purposes, college informational brochures clearly list courses that can be taken in high school that apply to advanced technology/Tech Prep college degree plans. For example, a high school student can earn up to 16 hours in drafting, 12–15 hours in office systems, business management, or computer information systems, 15 hours in electronics, 12 hours in biomedical technology or instrumentation, 9 hours in child care and development, 8 hours in welding, 9 hours in criminal justice, and 21 hours in CISCO networking technology.

In response to new program offerings at the college, one large high school in the area provides a variety of additional articulated courses, including Internet, telecommunications, word processing, C++ (replacing PASCAL), PowerPoint, CISCO, and desktop publishing. The smaller, surrounding schools in the consortium have added primarily CISCO and desktop publishing.

High Schools That Work. The largest high school in the district has been a Southern Regional Education Board (SREB) High Schools That Work (HSTW) site for 2 years, implementing the 10 key practices, developing a 5-year action plan, and beginning the process of integrating CTE and academic education. According to the principal, the “10 key practices [of HSTW] are a core belief system around here.” The initiative has “increased high expectations, focused the career guidance program, and increased curriculum integration.” In particular, the

high school has been very involved in curriculum integration using the train-the-trainer format. To date, about 100 teachers have been trained in HSTW chiefly on integration of academic and applied concepts.

Participating faculty have developed interdisciplinary units for use in their classes, integrating the content of various core academic courses and the core content of CTE courses—for example, an English Advanced Placement instructor working with a computer instructor to create an innovative PowerPoint presentation. Contextual teaching activities, with courses focusing on applied strategies, are now offered in geometry, physical science, physics, biology, aquatic science, English II, business communication, and economics, although these only represent about 10% of all course sections in these subject areas in fall 2000.

Despite these HSTW integration activities, it is evident that some high school counselors remain unconvinced that CTE is beneficial to all students, with CTE described as “the electrician, rather than the engineer.” This perception is further confounded by the fact that the new Career Development School (CDS) is physically located on a separate campus, along with the district’s school for students enrolled in alternative education. Beginning school year 2001–2002, the high school is expected to implement K–16 academic pathways for all students, including a career-planning process coordinated with the college counseling staff, which may alleviate some of the negative stigma. According to the principal, this planned career guidance program will help bridge the physical gap between campuses. In addition, many career classes are offered at the senior campus, including health occupations, computer/office technology, and drafting and design technology; and some of the career courses offered at the CDS, such as CISCO and criminal justice, may soon be transferred to the senior campus.

Although the HSTW initiative has been partially funded by the Tech Prep consortium for the last 2 years, high school staff is confused about the inter-relationships of the Tech Prep, STW, and HSTW initiatives. Despite this confusion, Tech Prep and HSTW are considered by high school administration to be seamless and non-competitive, with Tech Prep functioning in a supportive role to HSTW, which is considered the more predominant reform.

High School Reorganization. Beginning school year 2000–2001, the Independent School District (ISD) initiated a reorganization of its secondary school campuses. The two major high school campuses were consolidated and reorganized into a single High School with grades 9–10 on one campus, and grades 11–12 on another, senior, campus. Simultaneously, several CTE programs, including automotive technology, criminal justice, electronics, CISCO, and welding, were transferred to the new CDS, which is located on the same campus as the school district’s alternative education program.

The effects of this reorganization are not yet known, however there is concern that there will be negative effects from the physical separation of the three campuses, and that programs will suffer from lack of campus coordination. The separation from the senior campus limits CTE course offerings for freshmen and sophomores, and makes it more difficult to involve faculty in guiding course selection and career pathways. When implemented, a new career guidance program that focuses on academic concentrations is expected to alleviate this concern. In addition to the negative association of career development programs with alternative education,

transportation and scheduling may make it harder to attract and retain students in CTE programs, including Tech Prep. On the other hand, the new accelerated block schedule is seen as a benefit to CTE programs, and is anticipated to improve enrollment over time.

Raising State-Level Academic Standards. In 1999, the state legislature passed House Bill 2401, which codified Tech Prep in Texas. According to that legislation, all new Tech Prep programs must be based on the state's college-preparatory high school graduation plan the Recommended High School Program (RHSP). This requirement is regarded overall as positive for the image of Tech Prep because it clearly establishes Tech Prep as a college-preparatory program for technical careers. This may be a factor in an eventual shift in Tech-Prep student characteristics. According to the assistant superintendent for one school district, more "academically aggressive" students are already taking (articulated) Tech Prep courses.

On the other hand, some expressed concern that strict adherence to the RHSP limits Tech Prep students in several ways. First, smaller school districts may be unable to offer the required 2 years of a foreign language, due to teacher shortages. Second, the program's mandatory academic requirements leave room for only 3.5 elective credits in a 24-credit graduation plan, creating competition among CTE courses, athletics, band, and other student-activity classes. This potential problem is partially alleviated if schools implement block scheduling, which allows up to 28 credits. But, not all schools are able to offer an 8-period day or alternative scheduling options. A counselor at one high school stated that the recent change from an 8-period day back to a 7-period day had a big impact on Tech Prep program enrollment. According to her, "75% of our students interested in band and/or athletics can't do the (required) academics and Tech Prep (articulated courses)" because of course scheduling. Third, many students who take the RHSP are competing for class rank and opt to take GPA-weighted academic courses, rather than CTE courses. Undoubtedly, many potentially excellent Tech Prep candidates may be discouraged from participating because they fear they will not complete the entire RHSP curriculum.

Another state-level regulation has had a positive effect on Tech Prep programs. The advanced academic program, called the Distinguished Achievement Program (DAP), differs from the RHSP in that it requires 3 years of a foreign language and completion of four advanced measures, which include high scores on standardized tests, individual research projects, and/or successful completion of college courses, including Tech Prep articulated courses. One high school has taken full advantage of this last option, using Tech Prep articulated courses to satisfy requirements of the DAP, because other options are more difficult to offer to their students. Indeed, of the five high schools in the study group, most endorse a range of high school graduation plans for Tech Prep students (Minimum, RHSP, and DAP). One promotes only the RHSP, and it also offers weighted GPAs for articulated CTE courses.

Articulation. Over the last 5 years, implementation of a statewide initiative has influenced the consortium's articulation agreements. Standardization of entry-level workforce education courses at the postsecondary level and creation of a common course numbering system required each college to revise its courses to match those listed and described in the Workforce Education Course Manual (WECM) by fall 2000.

Consequently, all relevant articulation agreements were revised to reflect the new college course offerings, an activity that constituted much more than simple substitution of course rubrics. In some cases, high school courses previously articulated to college academic courses (such as computer science) are now articulated to non-academic transfer workforce education courses, or are no longer articulated—eliminating some college-credit opportunities via articulation. Annual secondary and postsecondary subject-area curriculum alignment meetings are the usual venue for working out and maintaining agreements between area high schools and the regional college.

Despite this transition in course offerings at the college level, Tech Prep articulated course offerings continued to expand. The list of locally articulated courses for school year 2000—2001 included 24 courses in the following areas, accounting, computer science, CISCO; criminal justice, electronics, welding, process technology, nursing, and drafting. Effective January 2001, there were over 150 course articulations with 23 regional school districts, over 70 of which are with high schools included in the study, and over 75 additional agreements with schools outside the consortium's service area.

Unfortunately, the focus on identification and alignment of courses for articulated college credit has detracted from the identification of Tech Prep as a 6-year program of study, despite the development of these educational plans for each program area. Presently, many schools consider any student in an articulated course a Tech Prep student. For example, of the area high schools in the study that responded to a fall 2000 state survey, all five indicated that they identify Tech Prep students based on their enrollment in a specific CTE course, rather than the approved state definition that requires participation in a state-approved sequence of CTE courses. The transition to academic concentrations, including Tech Prep program sequences, in the largest school district may help to change this perception, as a result of implementation of HSTW.

High school staff recognizes that more communication is needed among faculty of the high school and community college, and that more high school teachers need to work with the college to overcome barriers. Despite the issue over Tech Prep student identification, more Tech Prep students are being identified by the community college as Tech Prep, and receiving college credit for articulated courses.

Identification and Tracking of Tech Prep Participants. Compared to other consortia in the state, Golden Crescent has a fairly sophisticated process for the identification of potential secondary Tech Prep program participants, although it is based primarily on the identification of articulated course-takers. SCANTRON, a pencil-and-paper method of developing a student interest and participation database has been automated and is expected to appear on the consortium's web site in fall 2001.

The SCANTRON process supplements the state's formal procedures for identification of Tech Prep students that has been in place since 1993. Supplemental information includes student addresses, phone numbers, and areas of academic and career interest, providing valuable recruitment information to the college, as well as a list of potential Tech Prep students who may claim articulated credit. Valuable promotional information is produced from these data; for example, calculation of over \$830,000 in potential savings in college tuition and books for ISD

students over a 6-year period. In addition to this on-line Tech Prep interest and course enrollment form, the consortium has placed competency profiles for core courses on-line for easier access by high school and college faculty.

At the college level, changes in Tech Prep reporting are being implemented in response to Perkins III accountability requirements. Although the required state student-level report has included Tech Prep information in the past, a new reporting instrument was initiated by the state in June 2001 to help identify the number of Tech Prep high school students continuing to college, and the number of articulated credits awarded each year. Under the current system of self-identification, the college reported 740 declared Tech Prep majors in fall 1999, of 3,800 total students.

Work-Based Learning. Over the last 3 years, the consortium has initiated two new WBL activities, although opportunities are still somewhat limited for students. Under STW, over 250 students were placed in job-shadowing activities in over 100 businesses. High schools still offer traditional co-op and clinical opportunities for CTE students, although co-op in itself is no longer an articulated courses option.

According to a counselor at one rural high school, there has been an increase in the number of students participating in WBL experiences among students graduating under the minimal high school graduation plan. On the other hand, very few of her high school's upper-level academic students participate, opting instead to take additional academic courses.

Summer internships accommodate 13–20 academic and CTE teachers per year; however, not all schools are sending representatives, with the majority of teachers participating from nearby schools. The teacher internships have been very successful, consisting of 1–3 days in the business, followed by a half day of debriefing and a half day of writing integrated lesson plans.

University Connections. For several years, the Bachelor of Applied Science option at the regional university located adjacent to the community college campus has been available to students with Associate of Applied Science degrees. Although the program accepts 65 semester credit hours in transfer, and accommodates in almost any subject area, the degree continues to be under-utilized. University recruitment officials feel they are not getting the word out effectively to the community college students or the community, in general. To help address this and other enrollment issues, the upper-level university has implemented two new programs.

The first of these seeks to encourage students to continue baccalaureate study in the community college. University Direct is a dual-admission program designed to encourage the college's students to earn a baccalaureate degree at the region's 4-year university. While students earn an associate degree, they have access to university services, including faculty advisors for degree-plan counseling, career planning, and financial advising.

The second program, "Letting Education Achieve Dreams" (LEAD), is designed to raise community educational expectations, enhance career awareness, enable educational attainment, and promote adult/parental involvement in education. Activities include mentoring, campus visits, and exposing students to higher education. Under the program hundreds of elementary and

middle school students tour academic and technical programs on the 2- and 4-year college campuses, as well as local businesses and industries. The demographics of the community are increasingly Hispanic, a sector that is historically undereducated, and according to a university official, the LEAD program will help address this issue because "awareness and expectation increase the chance of attending college."

Contributors to Change

Despite the growth in program offerings experienced in the consortium, concerns remain. For example, Tech Prep students are still regarded by many as traditional non-college bound students, a problem that stems from continued lack of involvement and help from high school counselors. In addition, many of these counselors regard Tech Prep as merely articulated courses for college credit, rather than part of a College Prep program of study, and do not see the benefits of participation in CTE course sequences. Consequently, students are not uniformly assisted in preparing high school graduation plans in concert with 6-year Tech Prep program plans that lead to AAS degrees. Problems in communication are exacerbated by high turnover in high school administrative, counseling, and instructional staffs. Nevertheless, college counselors say they are seeing more students at the college who are receiving articulated credit and who show enthusiasm toward their college education. This trend may continue, assisted by dialogue between high school counselors who are invited to campus once a year to discuss Tech Prep and the career planning process, and a K-16 counseling program initiated this year by the ISD that brings college counselors to the school to meet with all levels of public school counseling staff.

Activities at the state level have also impacted the implementation of Tech Prep programs primarily state legislation requiring all Tech Prep high school programs to be based on the RHSP, a college-preparatory graduation plan. Although this appears beneficial to the image and subsequent growth of Tech Prep, some feel it creates a barrier, as smaller school districts cannot find the faculty needed to teach the required 2 years of foreign language. In addition, some fear the strict no-substitution College Preparatory curriculum eliminates some of the neglected majority from participating, although the state interprets completion of the RHSP as a goal for students participating in Tech Prep programs, rather than an absolute requirement.

Despite processes to identify students participating in articulated courses, many students fall through the cracks, failing to be identified when they enroll in the college, and consequently not receiving articulated credit. However, it is not entirely the responsibility of the receiving college to identify Tech Prep students. An articulated course-identifier for high school transcripts is often not placed on the transcript by the high school. The identifier is intended to signal college registrars or counseling staff that a course may be eligible for articulation. It is anticipated that future implementation of the statewide articulation process for CTE courses will enhance program enrollment by providing consistent information to counselors, and statewide articulation standards for commonly articulated courses.

Many changes in articulated course offerings are the result of the state's transition to a common course-numbering system for workforce education courses at the postsecondary level, which impacted all existing articulation agreements. In some cases, Tech Prep programs have

been enhanced, while others have been negatively impacted. For example, the college now offers computer science using the academic course rubric rather than the workforce education course rubric. Even though the course content is the same, the academic course is recognized as a transfer course, which requires that the instructor hold a master's degree and have 18 graduate hours in the teaching discipline.

The impact of reorganization of the two largest high schools in the consortium within the last year may have the effect of impeding further progress by complicating coordination. Both high schools now share the Developmental Career Center, which is in the same physical location as the alternative school, creating an associative image problem for CTE. Scheduling and transportation issues are also possible, although implementation of HSTW could mitigate this potential negative effect.

In addition, both the dean of workforce education and the dean of instruction at the community college are new to their positions, and the extent of their support of processes necessary for institutionalization of Tech Prep is not yet known. One, a college faculty member, remarked that the level of college support of Tech Prep has improved, and she is "now a believer, converted because she saw it work, and the effort of Tech Prep staff."

Although it does not impact Tech Prep programs directly, affecting only high school Tech Prep students who want to enroll concurrently in college, the state's Texas Assessment of Academic Skills Program (TAASP) continues as an issue. Under state law, students are prohibited from taking college-level courses unless they pass all three sections of the TAASP exam (reading, writing, and mathematics) or alternative tests that provide similar assessments such as COMPASS or ASSET. Also students are exempt if they achieve high test scores on the high school exit exam (TAAS), the SAT I or ACT, or if they enroll in a college certificate program of 42 credit hours or less.

The consortium continues to address many of these issues by providing staff development for area high schools, including a comprehensive annual winter conference that includes information on each of community college's Tech Prep programs. Participating school districts are also optimistic about the future. For example, one high school wants to continue to work with colleges and schools to maintain and add Tech Prep courses and programs, and another recognizes gaps in data reporting and wants to work on improving follow-through on proper labeling of courses on high schools transcripts. Another high school sees the need for more staff development, particularly in how to get articulated credit awarded and how to use the "A" code on high school transcripts to denote articulated courses.

Mt. Hood Educational Partnership

Introduction

Prior to 1999, the Mt. Hood educational partnership, located in Gresham, OR, just outside Portland, had set three major goals for its Tech Prep initiative students should be able to advance in college programs; students should be able to enter the 1st year of college without repeating coursework; and students should eventually be able to achieve an associate of applied science (AAS) degree, certificates, or college credits. During our two visits in December 2000 and January 2001, these goals continued to be expressed by local teachers and administrators, and the consortium continued to place emphasis on providing students with the necessary science, math, and professional-technical education (PTE) [the local and state terminology for career-technical education (CTE)], and the planning necessary to transition students into their 13th year at the local community college.

Other goals were expressed for the consortium, reflecting new or increasingly important priorities. In particular, there was a perceived need to increase apprenticeship opportunities in target firms, such as Boeing. The consortium also sought to establish gender balance by encouraging more female students to enter programs. Schools in the region and the community college made concerted efforts to insure that their instructors represented a diversity of race and ethnic backgrounds, and that both men and women were employed in teaching non-traditional occupations. In 1998, the consortium began to provide funds and encouragement to high schools to participate in annual conferences presented by the Regional Gender Equity Team, which provides career information to females on nontraditional occupations, such as carpentry, construction, and engineering. The consortium sought to respond to changes in the broader community by paying more attention to retention and dropout rates, and emphasizing English as a Second Language (ESL) programs. Efforts to meet the needs of a diverse group of students are consistent with an earlier goal of this consortium, which is that "all students need a year-13 as a goal."

Major Changes

Expanded Enrollments. From academic year 1998–99 to 1999–2000, enrollments increased in 2+2 Tech Prep programs by approximately 150%, totaling 265 students in the region in 1999–2000. The number of credits earned increased too, by 225% from the previous year. Looking beyond 2+2 Tech Prep participants, the consortium documented another 1,000 high school students enrolled in the Early Collegiate Opportunity (ECO) program, which includes some students who would be considered Tech Prep course-takers, though not fully engaged in Tech Prep. Total student participation in the combined 2+2 and ECO programs increased by 50% in 1999–2000 over 1998–99, then held steady from 1999–2000 to 2000–01. Results of research conducted by the community college shows that the tuition savings for students who participate in these programs is substantial. Nearly \$1.5 million in savings was computed for students in the ECO program based on a local university tuition rate; nearly \$50,000 tuition savings was calculated for Tech Prep students who had accrued college credits during high school. The college's institutional research office concluded, based on another local study, that 50% of 2+2

students had continued at the community college after high school for an average of 28 additional college-credit-hours.

Assessment via the CIM and CAM. Oregon's education reforms established the Certificate of Initial Mastery (CIM), to be awarded at the end of the tenth grade to students who could demonstrate foundational academic and technical skills. The scores of tenth graders in math and English, however, were not entirely satisfactory. According to local educators, only 40% of tenth graders passed the CIM math exam, and only 60% passed English. The CIM is perceived as "disconnected" from "academic expectations," and does not foster contextual learning. It was perceived as putting too much emphasis on reading, to the neglect of writing skills, which is now seen by teachers and administrators at one high school to be a tremendous disadvantage to students. "Kids were turned off by the CIM. They didn't want to play" because it did not have sufficient incentives for students; it was "pure, boring academic stuff," according to the local Tech Prep coordinator. Only one high school used CIM as a graduation requirement, but in the year 2000, that school had moved away from that policy because it "discourages students" from achieving the more advanced Certificate of Advanced Mastery (CAM). Also, students and parents perceived that it was "meaningless" because it was not connected to CAM. The local community college did not use CIM scores either, so there was little incentive to implement this certificate on any level.

The CAM is supposed to be awarded at the conclusion of the 12th grade to students who exhibit mastery in career-related endorsement areas. CAM is credited with playing a role at the high school level in creating articulated career pathways, even though it will not be fully implemented until 2004. Although it is not entirely consistent with Tech Prep, the CAM is geared toward students in their senior year, to connect academic work to the workplace. In its original form, CAM was to include six career pathways, with a capstone portfolio to demonstrate competency. The community college has also been a partner to high schools in developing CAM at the high-school level; the CAM can align with 2+2 programs, as well as traditional CTE. The English CAM involves a written senior project and an internship project. It may be too early to tell whether or not CAM will begin to disappear as CIM has done, since the class of 2001 will be the first to earn the CAM, but it appears that local people, especially teachers at the high school level, are hopeful that it can stand the test of time. In the early years of Oregon's reform act, CAM was not precisely defined, except for six broad career areas, and local high schools had considerable latitude to develop programs as they saw fit. This freedom continues to be in evidence, as high schools develop and articulate career pathways, and this flexibility is seen as an asset and attributed with potential success.

Articulation. According to local education personnel, institutionalization of articulation was a positive result of federal funding, and helped local Tech Prep programs develop a more enduring alignment with postsecondary education. One of the features of the stronger emphasis on articulation of CTE and academic education has been the Early College Opportunity (ECO) program. ECO has impacted retention of Tech Prep students who transition from high school to college by offering courses for dual credit. It began in the early 1990s with general education courses (composition, calculus, etc.). Over time, ECO has become more closely tied to Tech Prep, so that Tech Prep students are some of the most frequent participants, according to the

regional coordinator. He estimated that half of all high school students are now taking "college eligible" curriculum. Of the 576 students enrolled in ECO and in 2+2 programs in 1996-97, 40% had received an associate degree by fall of 1999, according to a local 1999-2000 Annual Report.

Articulation has benefited from collaboration by secondary and postsecondary faculty in similar content areas, as they build curriculum together. The introduction of a consortium-level regional coordinator situated at the community college, who can establish and foster connections between the high schools and the community college, has been a crucial keystone to the strengthening of articulation.

In some cases, however, articulation has not met students' needs. For example, math and engineering courses required more alignment, as the consortium continued to work with universities to provide first-year university courses at the high school. Also, articulation agreements did not insure that students were prepared for college-level work. The college's institutional researcher stated that 20% of area high school students coming to the college were unprepared, though he also said that this percentage has been higher, indicating 20% is an improvement. He explained that most professional-technical students at the community college were older students, not arriving directly from high school suggesting articulation is not a factor for many professional-technical students.

Nonetheless, articulation has allowed students to complete college credits prior to their graduation from high school, including in academic subjects. At one high school, students in the 2+2 program could get 9 college credits in English. Indeed, seniors could complete their high school education on the community college campus, and some were doing that. Nearly half of all Tech Prep and non-Tech Prep students had transcribed credits with the community college. Students in this consortium stored up college credit, and often essentially "transferred" to the community college in their senior year of high school, indicating more college credit was being transcribed than ever before.

Career Clusters and Pathways. Students in this consortium were encouraged to think about career pathways beginning in the eighth grade as a way to retain them, giving them a reason for them to stay in school. Core curriculum at one high school relied upon career pathways by 1998, and has continued to do so to the present. In the mid-1990s, learning communities or "houses" were organized in one high school in grades 9 and 10, and operated independently of grades 11 and 12. These grades are aligned now with career pathways, and they begin in middle school with faculty transition teams. The middle school aligns its schedule and classes with the high school, attempting to create a seamless transition to the secondary level. Teachers create career academies at the high-school level after observing models at other schools. Recently recognized as a New American High School, one high school's experiment with curriculum has led to numerous changes that benefit students, including improvements in student transition to college.

The community college works directly with one high school to update curriculum, and participates in the Career Pathways Guide at another high school, where parental participation is high. Nevertheless, some CTE programs struggle to align themselves with industry standards and curriculum. One primary feature of the alignment of core curriculum between the high school

and community college is the collaborative teams of high school and community college teachers who develop integrated coursework in math, writing, and technology.

This strength continues to be identified as a major feature of the Tech Prep program. Strong faculty relations between high school and community college teachers have helped to increase articulation and integrated curriculum development via career pathways, and have enhanced the connections between students and industry. A key factor in these strong relations is the leadership and organizational skills of the consortium's regional coordinator, having now served in a leadership position for about 4 years. His work has resulted in much stronger relationships between the community college and the region's high schools.

Raising Academic Standards. Concern for raising academic standards has long been a motivating factor of Oregon's educational reforms. CIM and CAM implementation was an expression of that concern, because it was thought to provide a way to raise standards for all students. Since its implementation, discussion of raising academic standards has continued to take place among major stakeholders. With respect to professional-technical education, Perkins III has shifted legislative emphasis from raising standards to retention, according to the college's vice president for student services. Tech Prep seems to operate outside this academic standard because business and industry has put forward its own set of standards and requirements. More professional-technical programs are using national occupational standards and certification, and because these programs offer employment options to high school students, educators have moved steadily toward implementing them.

Integration of academic and professional technical education was originally intended, under the state's Education Act for the 21st Century, to be a fundamental tool for increasing academic standards. Secondary teachers and staff were required to develop and implement integrated educational experiences for students. High school teachers, however, expressed frustration with the overwhelming expectations implied by this emphasis. Previously, officials at one high school had discussed implementation of Contextual Learning and Integrated Curriculum (CLIC) teams, made up of six teachers and a principal. These CLIC teams were responsible for integrating English, social studies, science, and health into a block of 60 ninth and tenth graders. This experiment required block scheduling to allow more time for students to complete projects, and to allow teaching teams to provide more individual and small-group instruction. Some local educators have concluded that block scheduling disrupts continuous contact with the students, with teachers feeling that it separates them from students for too long.

Probably, CLIC has been most successful at the high school that launched it in 1993-94. It began in this school with the Jefferson House, an integrated teams concept, and eventually evolved into the four current houses. The idea of this initiative was to make learning more individualized and contextualized. A difficulty that this school encountered was that the Focus Class was designed only for the 9th and 10th grade blocks. High school administrators felt that the concept of integrated curriculum was clear, but that the implementation was incomplete. Support services were intended to follow the students through their high-school experience, but they were limited, and students could not continue through grades 11th and 12th. In fact, educators concluded that the concept of integrated curriculum and contextual learning needed to

expand so that it would take the students not only through high school, but, into the next level, grade 13.

Also, it has been difficult to involve more teachers in curriculum integration because they resist taking time for professional development activities, limiting their ability to become familiar with the Tech Prep consortium and its programs. At the secondary level, it appears that creating blocks of courses in an attempt to integrate has been somewhat more successful. An example of this was the accounting program at one high school, which has been completely revised. It has changed from individualized, self-guided study, to a more prescribed curriculum that connects high-school coursework to college coursework. The revised curriculum also moves away from business and management toward accounting and marketing, with an emphasis on integrated projects that focus on the business community outside the schools.

Finally, some high school counselors are still not perceived as understanding the importance of seamless education for more than the top-quartile students. They diminish the value that connections to business and industry can have in the education of students, and their communication about Tech Prep to parents and students sometimes reflects this bias. Within the schools, skepticism arises as well. Some school administrators argue that Perkins III perpetuates the separation of academics and CTE, as do the policies of the state.

Changing Demographics. A concern in the region is the expected increase in Hispanic minority students, and the inability of educational institutions to meet their needs. In 1999, the group of minority Tech Prep students was modest, at about 15%, but the consortium expects a continued increase because more migrant workers are moving to the region. This increase is expected to hit the community college full force in roughly 7–10 years, but the Tech Prep leadership is concerned that, if changes do not occur within the next few years, these new students will not be served. A new Teacher Assistant Certification Program that attracts members of underrepresented groups to participate in a bilingual-teacher-pathway partnership with Portland State University is being developed. In addition, English as a Second Language (ESL) is emerging as a core curriculum initiative at both the secondary and postsecondary levels. In fact, one high school has recently added a half-time ESL teacher, and has already seen an impact on the dropout rates among these students, because incoming Hispanic students are integrated more fully. The Central American Students' Success (CASS) organization is part of an "emerging core," responding to the rapidly changing demographics, with the goal of helping all students reach year 13. CASS is an ESL-immersion program using the house system. Staffing this program is not easy, though. The consortium is still looking for a bilingual-certified art teacher, in its effort to develop curriculum and necessary role models.

One particular related concern is an expected increase in the dropout rates among these minority groups, as students leave school for immediate employment opportunities. It becomes even more important to emphasize the necessity of getting students through high school and into grade 13. The consortium has begun to consider the usefulness of developing a common set of transferable skills among high schools, so that students who belong to a mobile population can adhere to region-wide, academic and career-related standards but this particular issue has not yet been settled.

Changes due to Perkins III. Perkins III is perceived to require a much more complicated tracking of students and reporting of funding than was apparent with Perkins II. However, Perkins III rules are cumbersome, according to local administrators, and the state's requirements are thought to add to the burden on local staff. Oregon state rules are perceived as making the federal process more complex, but not necessarily more effective. Statewide data collection is required, and the drive to document accountability has been one of the primary changes since 1998.

However, Perkins III funding for Tech Prep was beneficial to local efforts. Perkins Tech Prep funds were used earlier to support the hiring of a regional coordinator, and that individual has been successful in creating the connections between the high school and the community college. Despite complaints about the inflexibility of Perkins III on the question of reporting, Perkins III continues to support the Tech Prep programs, as intended. It also allows the flexibility to plan regionally, even if reporting is burdensome. Indeed, Tech Prep funds are seen as instrumental in supporting collaboration, creating a viable network, and fostering articulation.

Curriculum Reform/Reorganization. Creation of the Center for Advanced Learning (CAL) is cited as the primary change in this consortium in the last several years. One of the key elements in the development of this idea is the collaboration between secondary school superintendents and the president of the community college, who approached the consortium and asked it to examine some of the common dilemmas of the region. Local educators expect this center to open in Fall 2002 with 500 students, though it will have a capacity of 700 students, with a waiting list by the 2nd or 3rd year. The CAL arises out of a push to address the issue of the economic vitality of local communities. A local levy for \$7.5 million provides funding to bring local partners together to discuss how to foster this vitality, and one of the creations of this initial collaboration was the CAL. A bond levy of \$35 million was passed, but the consortium has not yet determined how it will disburse resources.

The CAL will offer day classes and services to high school students, and evening services for the community. It will feature flexible, project-based learning, and has attracted participation from a wide variety of business and industry, and other community partners, such as a local hospital. It will provide state-of-the-art labs and clinical sites for students, including a region-wide robotics program at the middle school level. The community college will provide faculty and will be involved in "making the curriculum as 'postsecondary eligible' as possible." Local high schools will also provide faculty. The intent is also that the CAL will offer students experiences "as much like the workplace as possible." In total, about 8,000 students from four partner high schools will have access to CAL, and these students will be selected through application. The CAL will cater to students who seek a 2-year degree in a professional-technical area, and who want opportunities to continue their education at both the 2-year and 4-year levels.

Business and Industry Involvement. Business and industry partners serve on the advisory board of the CAL, one of the most important initiatives in the several last years. The consortium coordinator believes that the educational institutions have a strong mutually beneficial relationship with private-sector business and industry.

Over the years, the consortium has been able to establish important partnerships with business and industry. In particular, the community college has developed a relationship with Boeing, allowing for the development of apprenticeships for about 20–25 students. Other corporations developing partnerships with the community college include Fujitsu and DuPont. These additions have grown out of relationships already in place. In 1996, the consortium established a Microelectronics Training Center, in partnership with major corporations in the region, which has allowed the community college to play a central role not only in training the employees already working in the industry, but also in training students who plan to enter. Faculty members also benefit from these partnerships because they are able to participate in worksite training, and from that experience build realistic projects, lesson plans, and assessment tools into their curriculum. Faculty efforts also facilitate curriculum alignment from high school to the community college, with an eye toward addressing industry standards.

Contributors to Change

Changes in the Mt. Hood consortium can best be explained within the context of the relationships between major stakeholders who seek to create a system that can facilitate a seamless transition of students into grade 13 of college. The give and take among stakeholders within the consortium explains why some changes are not uniform across the consortium. One of the more notable changes was some disaffection with the CIM. For example, one high school moved dramatically away from CIM as a graduation requirement, while another continues to adhere to CIM for this purpose. Why do schools of the consortium respond so differently? One explanation is how local school leaders respond to the idea of the CIM. In one school, the CIM was seen as an obstruction to the seamless transition of students from middle school through the 13th grade because it seemed to create a break between 10th and 11th grades, and because it did not foster contextual learning. At another school, the CIM helped to maintain the GPA at a C (2.0) or better, and it continued to be accepted. Of even greater importance than how these elements fit together within the schools was how administrators acknowledged the voice of parents and students when they assessed the value of these changes. Without overstating the case, it seemed to us observers that administrators with higher student-focus were more responsive to, and engaged in, leading change.

In addition, it is necessary to recognize that the CIM/CAM question has not yet been resolved at the state level, much less within the consortium. Even though CAM continues to be viewed favorably, it is possible that, once implementation has taken place, local administrators, teachers, students, and parents may realize that this idea has faults. They may begin to reject CAM, as they did the CIM, as a means of raising academic standards for students, and as a bridge to the first year of college. But in the case of CIM/CAM, a fundamental lack of alignment between these certificates has caused the abandonment of CIM, together with the continuing favor of CAM. High schools are not fully committed to CIM as a graduation requirement; the community college shows little loyalty to CIM because it does not rely on CIM scores when accepting new students. CIM does not foster contextual, integrated learning, even at high schools that use it as a graduation requirement. Without loyalty to the idea, the CIM cannot thrive as an element of Tech Prep and serve to align career education. Thus, in 1998–99, when we first visited this site, the CIM and CAM were seen as the only certificates that would be recognized as

keys to entering higher education and the workplace, and their implementation did spark debate. By late 2000 and early 2001, the CIM had fallen from favor while the CAM was viewed with more hope, but is still too new for its impact to be assessed fully.

Similarly, articulation works best in this consortium when faculty are involved and committed to the idea, and this is evident in the Early College Opportunity (ECO) program. Collaboration of high school teachers and community college faculty in similar content areas has created articulated curriculum and built trust, which is seen by local personnel as an important aspect of articulation. This sort of relationship can only grow out of long association and experience. This may not be a change, *per se*, but a continuation of something that has been growing and developing throughout the history of the consortium. It allows institutional agreements to be made, and integrated coursework to develop, providing students with a richer education.

The deepening institutionalization of articulation has been possible also because of the expanding implementation of career pathways, and because of the involvement of industry in aligning curriculum between high schools and the community college, in light of occupational standards. Curriculum alignment has expanded throughout the education system, encouraged by the influence of CAM, which has motivated educators to create career pathways beginning in the middle schools. High schools create learning communities in early grades and implement CAM in the later grades. CAM then connects seniors to the workplace through the senior project, which places students in business and industry internships. The motivation for these linkages seems to derive from the influence of Tech Prep, which has been a stimulus for consortium-industry partnerships, as well as for articulation and integration of curriculum. Local administrators, however, seem to identify Tech Prep and Perkins with "reporting activities." As the consortium makes changes to meet the needs of the increasingly diverse local population, perhaps Tech Prep reporting and funding will play a role, but it is the awareness and dynamic leadership of the consortium, with a finger on the pulse of the community's needs, that seems to drive change at this point.

Having said this, is it worthwhile for policy makers to reevaluate how Perkins might better facilitate the success of dynamic educational leadership, instead of creating friction or barriers to the changes that such a leadership would like to implement? Criticism of Perkins III among those we interviewed revolves around reporting and funding procedures that are considered too cumbersome. Not only that, Perkins is accused of not facilitating integration of academic and vocational curricula to the satisfaction of some. In fairness, however, it should be noted that Perkins does encourage the training of key people, including counselors, who are acknowledged to play a role in establishing seamless transition from middle school through college. Nonetheless, the fact that local teachers and leaders still consider counselors to be untrained and without sufficient understanding may be a telling point about the efficacy of Perkins at the local level.

What, then, motivates change at the local consortium level, if not solely the carrot and stick of federal legislation? The overriding impression from our interviews is that the consortium wants to move its students as quickly and efficiently through the school system and into

postsecondary education as possible. Business and industry has provided the leverage to enhance partnerships between the high schools and community college to provide input into curriculum and academic standards. Businesses have participated in the Center for Advanced Learning (CAL), providing advisement and money for labs and clinical equipment that supplements Perkins III funding. They have helped to define the career pathways, and have provided apprenticeships, internships, and WBL experiences for faculty and students. They have also provided professional-technical faculty to teach at the CAL and other charter schools, which can bypass teacher certification standards. The consortium has courted the involvement of business and industry diligently. When a prize like Boeing comes along, leaders are anxious to involve students in that opportunity.

Tech Prep and Perkins cannot be singled out as the only source, or even the most important source, of educational reform in this consortium. It seems more accurate to portray Tech Prep as one thread in a rich weave of reform activities. Consortium and community leaders, business and industry, and faculty all have a tremendous impact on what has changed and what continues to evolve here. It is most important to acknowledge that the Tech Prep consortium continues to adapt to its environment, and that it continues to balance constituents' needs without misplaced loyalty to any single idea or initiative.

Miami Valley Tech Prep Consortium³

Introduction

The Miami Valley Tech Prep Consortium (<http://www.mvtechprep.org/>) is located in the Dayton, OH metropolitan area. The primary goals of this consortium include enhancing school guidance to support students in specific Tech Prep pathways, continuing to emphasize professional development, and clarifying the relationship between local and state tracking systems. Recent efforts include increasing and enhancing WBL, increasing the visibility of Tech Prep at the postsecondary level, increasingly institutionalizing secondary-to-postsecondary pathways, enhancing local efforts at collaboration and curriculum development, increasing Tech Prep enrollments by continuing to insure the quality of the program, and enhancing professional development, especially for academic faculty.

As time has passed and more confidence has gathered to implement Tech Prep, administrators, faculty, and counselors seem more willing to step outside of the mainstream of practice to serve students' needs. In describing reasons for change, local leaders indicated that changes in high school graduation requirements and the awarding of credits have been driving forces in change, and enhanced transition of secondary Tech Prep participants to college resulted.

³ Donna A. Dare has been a member of our research team since the beginning of the CC&B study, and she is acknowledged for drafting the original report for this consortium, with support from Jung-sup Yoo, another core member of our research team.

Major Changes

Consortium administrators identified three general areas in which they felt substantive changes had occurred in 1998. First, the community college provides leadership for program modifications that support the essential vision of Tech Prep, new career pathways linked to Tech Prep, and the development of new curriculum to support these pathways. Second, collaboration with business partners has been enhanced to benefit the on-going implementation of Tech Prep in the region. Third, professional development and faculty engagement have improved at both the secondary and postsecondary levels.

Curriculum Reform. An increasing frequency of partnerships with business and industry has impacted program development at the school level across the consortium. As one consortium leader described the process, educational programs evolve "in tandem" with business and industry needs. The Greater Dayton Information Technology Alliance (GDITA) and the Dayton Auto Association (DAA) represent two driving forces of recent change in Tech Prep programs. Two hundred companies participate in the GDITA, and provide strong input in the Information Technology (IT) curriculum development process. GDITA members identify IT careers and provide students with career information. The college is partnered with both high schools and local universities to establish career pathways for all of the designated programs of study outlined by the GDITA.

A college faculty member who acts as a Tech Prep liaison to the schools described the IT curriculum development process as highly collaborative. She indicated that, in recent years, the college essentially threw out the old curriculum and started over again. In doing so, the consortium worked with the GDITA and adopted the IT Works model (similar to the North West Center for Emerging Technologies model), which includes eight clusters of study for IT careers. Using this model, the college worked with local high schools and area career centers to develop five core courses that would articulate to the college. They work together at least quarterly to insure that specific competencies are consistently addressed. IT curriculum at one of the area career centers includes software applications, web design, programming, and networking, and emphasizes troubleshooting and problem solving. According to the Tech Prep liaison, students believe that the program is more rigorous than programs available at their home high school, and that they are "a step ahead" of their peers.

At a second area career center, the IT curriculum has evolved from computer information services to computer service technology and now to IT, in association with IT Works. New competencies have been added during the past year, including C++ certification, Java Script, and Java. Other major changes in curriculum include the development of pathways in digital design and interactive media. Various certifications are also offered as part of the curriculum, and the center is a testing site for Mouse and Microsoft Office certifications. The goal is to certify all students in all Microsoft programs by the end of the junior year, and to include A+, Net+, Inet+, and CISCO certifications by the end of the senior year. Faculty cited professional development and collaboration as major factors in these curricular changes.

According to the consortium's Tech Prep coordinator, student participation in these IT programs has increased. The approximately 400 incoming students have higher ability levels and greater enthusiasm and expertise, with modification of the college-level program as a requirement to meet their needs. The most significant challenge is finding faculty to teach at the college level, and thus respond to the increasing demands of incoming students. In fact, the IT programs at the community college currently have waiting lists. As the college liaison stated, the students have "become victims of our successes." They are currently working with 14 comprehensive high schools, as well as the area career centers, and 10 more schools want to participate in the articulated programs in IT.

By developing six areas of concentration for IT curriculum, more advisory committees have been established. Business participation has increased significantly in curriculum development, WBL, and professional development. As part of their support of Tech Prep, the GDITA now supports professional development of faculty by providing opportunities for licensure and certification of teachers to teach IT courses. The consortium provides stipends for teachers to participate in these professional development activities.

In another curriculum area, the Dayton Automotive Association (DAA) promotes quality programming by engaging in advisory council work, curriculum development, and WBL opportunities for students at both the high school and postsecondary levels. According to the college liaison for the automotive program, the need for skilled automotive technicians has increased significantly in recent years, and the automotive technology curriculum has been upgraded to address current technology demands. The program now includes an analytic brake systems component for Tech Prep students.

Engineering is another area of study that has benefited from increased collaboration between secondary and postsecondary schools, and business and industry. With 23 disciplines in the engineering division at the community college, core curriculum has been developed with the input of the advisory councils. The industrial engineering program now includes manufacturing engineering and automotive technology, as well as other disciplines. Two courses in particular have been developed to address high-school-level instructional needs: a study skills course, and an introduction to engineering technology. Math and science are emphasized more now at the high-school level for students in these programs, and students are taught to understand engineering drawings. Courses in the cluster area are monitored, and Tech Prep students get the same degree as pre-engineering students. The program previously had a ceiling of 100 credit hours, but has been increased to 110 credit hours.

Engineering technology students from one area career center indicated that their program of study included robotics, machining, CAD, electronics, and other engineering-related technologies. They take advanced math (trigonometry and pre-calculus), technical English, and government and economics. These students intend to pursue a community college degree, with articulated credit and scholarships being significant factors in that decision, plus the opportunity to pursue a 4-year degree. As an indicator of their skill attainment and the quality of the high school programs, officials also indicated that they had been successful in defeating college-level teams in robotics competition.

Allied health programs at both area career centers have increased from four to twelve in recent years, and all allied health programs are now designated as Tech Prep. Five courses have been developed as articulated courses, for a total of 18 hours of articulated credit, including introduction to health careers, human biology, allied-health math, and two courses in medical terminology. Students receive articulated credit if they receive a C or better in the high school course and if they pass the proficiency exam. Tests and pre-recorded instructional units are developed by the college faculty and sent out to the high schools. In other courses, high school instructors incorporate units of instruction addressing specific competencies into their curriculum. Math 106 and Biology 107 show a "Y" on the college transcript for articulated credit, but all other courses are graded and sent to the course facilitator at the college.

The allied health program at one area career center has undergone several changes. Certified nursing assistant (CNA) students are now state-tested for their exiting skills. The college also requires that entering students pass the state test for CNA, thereby reinforcing the attainment of competencies at the high school level. The use of instructional technologies has increased. Nursing students watch bypass surgery on the Internet, do stitch simulations, and practice heart stimulation and manipulation on the computer. Students also create PowerPoint presentations and build interactive web pages.

Area career centers have modified according to state mandates to become less vocational and more focused on CTE. They emphasize high-skill, high-wage careers, and focus more on apprenticeships and national certifications and standards, such as NIMS in manufacturing, AWS in welding, PIA in printing, and ASE in automotive technology. Curricula have been modified to insure that students leave their program of study with national certification, where available. The administrator at one area career center indicated that all of their programs now follow the Tech Prep model, with a commitment to high-level academic standards, a strong technical component, and WBL opportunities.

Academic work is also more closely tied to a cluster area, rather than to a specific program of study. Academic and lab instructors align all coursework. Courses at one area career center have been modified to include more broadly applied curriculum. Math courses include a wider range of applications, and in accordance with state directives, math is emphasized in all programs. There has also been a concerted effort to merge contextual learning with more general learning experiences. While some courses such as Principles of Technology have been retained, other courses have been changed to address a more career-cluster-oriented, contextual approach.

At a second area career center, academic courses have been rewritten to be more integrated and applied, although the word "applied" is dropped from all course titles to avoid a negative stigma. To rewrite curriculum, faculty and staff use a curriculum mapping process, which includes identifying existing gaps in the curriculum, and making needed modifications. The goal is to include academic course offerings within pathways, to insure that teachers use competency-based assessments, and to work with counselors to insure that students are placed in courses that best meet their academic and career goals. Counselors at this area career center meet with students once each month to assess student progress and to determine proficiency level.

An academy model was adopted at one area career center in 2001–02. Students entering programs in this cluster area participate in modules of instruction in business technologies, business law, management, marketing, accounting classes, as well as business programming and e-commerce. Building on previous models for developing technical competency profiles (TCPs), the business cluster programs that will be part of the academy are being developed in alignment with the community college and other local universities.

Several comprehensive high schools have developed new program offerings to support enhancement of CTE and advancement into Tech Prep. At one high school, a Tech Prep environmental science program is offered to college-bound students who are academically strong in science. The program, highly academic in focus, is highly integrated and applied, and has a current waiting list of 80 students. Academic as well as workplace skills are infused in the curriculum and learning experiences. Students in the program learn scuba diving and receive OSHA certification and college credit for their coursework. Other activities include surveying a park to put in posts for a baseball diamond, and soil sampling.

Whereas this school has always maintained a relationship with its area career center, historically its on-campus Tech Prep programs have been less popular. Tech Prep was virtually non-existent on campus until the implementation of the environmental science program. Building on the success of this program, the school is now revising its business administration and management program as a Tech Prep curriculum pathway.

Another comprehensive high school in the consortium indicated that the primary changes were expansion of Tech Prep programs to include computer support, industrial engineering technology, environmental management, and business technology; the development of articulation agreements for their Tech Prep programs; and an enhanced relationship with the community college. Since 1998, this school also has developed a small business enterprise (SBE) where students own a company that markets and sells "Creative Ties." All students in the class own stock and are shareholders in the company. As part of their learning experiences, the class conducts balloon sales, provides embroidery and screen-printing services, and sells carnations for Valentine's Day. During the first semester, the SBE made enough profit that all students received \$100 dividend checks from the sales. Students manage all aspects of the business, with the teacher serving as a resource person. They also develop an exchange with other students in another country who are engaged in a similar enterprise. As part of the curriculum, students develop resumes and career portfolios.

Another curriculum modification at this school is an increase in required math, science, and social studies in 2001–02. The community college has helped purchase equipment to support an award-winning robotics program. Also developed and implemented is an environmental management pathway that includes ecology, soils, a water project, wildlife, forestry, industrial environments, and OSHA training. IT students also take a highly integrated English course that combines technical writing and literature. Readings for the class are related to business, and computer technology is integrated throughout the course. The integrated English course is included in the IT block.

Work-Based Learning. While mentoring in the automotive technology program took place earlier, GDITA has implemented mentoring and internships for Tech Prep students. Through the high school mentorship program, Tech Prep students are selected to work 12–25 compensated hours per week under the supervision of a designated work-site mentor. High school teachers work with work-site mentors to monitor students' work each week. At the college level, supervised summer internships, as well as other internships offered over the course of the academic year, are structured to provide IT students with opportunities to intern in multiple companies over the course of their college career. The high school to college transition is designed as a truly seamless educational path supported by a continuum of WBL experiences.

At one area career center in particular, emphasis on job shadowing and internships has increased over the previous years. In addition, the center's advisory committees have been expanded over previous years, thereby enhancing opportunities for WBL to be established or modified.

Articulation. Though the college has historically emphasized articulation and seamless transition of students, articulation agreements are now reviewed every 1 to 2 years. Though previously all articulation agreements were with the region's two area career centers, articulation agreements have been developed with a number of comprehensive high schools, which now offer technical programs.

In some areas of allied health, competency profiles have been changed at the state level, and the college works with local high schools and universities to insure that the required competencies are addressed in the curriculum. As part of the college's Postsecondary Enrollment Option (PEO), competencies are addressed through delivery of curriculum, and students now have the opportunity to sit for exams that are proctored by college staff. Students who receive a C or better on the exams are awarded college credit for designated coursework. Students can now sit for academic credit for Algebra 101, as well as for credit in technical courses, such as medical terminology.

In recent years, collaboration between secondary and postsecondary educators has increased significantly, and the faculty has undertaken management of articulated credit. In allied health, for example, faculty members coordinate the delivery of five courses offered to high school students, and are given reassigned time through personal service agreements. An allied health summit is held yearly to provide faculty the opportunity to coordinate the delivery of these five courses so they are aligned with courses offered at the community college.

A significant factor in the on-going implementation of Tech Prep in this region is the high level of understanding of Tech Prep among faculty, particularly at the community college level. Developing and implementing the curriculum has required an increase in deliberate partnering of faculty from several divisions of the college, including computer information services, business, engineering/industrial technology, allied health, and general engineering technology.

Tech Prep programs include the assignment of staff from different divisions who serve as liaisons. These faculty assignments serve to increase awareness of and involvement in Tech Prep across the college. Curriculum development, professional development, and collaboration efforts

have enabled the faculty to understand the value of more collaborative approaches to curriculum development and delivery of instruction. In recent years, the college has been able to use its National Science Foundation (NSF) grant in biotechnology to bring together both academic and technical faculty to support the movement of students through their program into technical careers.

Despite these improvements, high school teachers indicated that more changes are needed in the articulation process. Recommended changes include the awarding of a letter grade rather than a "Y" for articulated coursework. Post-testing for required competencies was also recommended. Recognizing this, some state universities no longer accept Tech Prep articulated credit with a "Y" transcript designation, so consortium leaders recommend that officials standardize proficiency tests to support transition.

Career Development and Other Preparatory Services. Though in previous years emphasis was placed on individualized career plans (ICPs), now career passports predominate. For each student, a letter is signed by the area center's administrator guaranteeing competency in the program of study. Resumes are developed in all English classes and include a list of competencies attained by the student. Students also take Work Keys, and these state test scores (such as scores on the ITAC [Integrated Technical and Academic Competencies] tests) are included in the passport. Transcripts include grades and attendance records. Certifications achieved by students are included, along with their diploma, a list of all awards, and samples of their work.

Students at one comprehensive high school indicated that career awareness was strongly emphasized to students beginning at the middle school level. Sophomores at this high school all participate in a Career Expo, which has been expanded to include 60- to 90-minute presentations over a 4-day period. Students indicated that they had looked at career pathways by middle school, but that the Career Expo helped them to firm up their career options and educational plans.

Tech Prep Awareness Day continues to be a major thrust in linking educational and career planning for students across the consortium. This day is supplemented by a variety of school-level activities to advance career awareness and exploration for students across the consortium. Faculty from across the consortium indicated that career awareness-building activities supported by Tech Prep have been driven down to the elementary and middle-school levels in recent years, and this focus has fostered increased interest in and awareness of Tech Prep as an educational option.

Students entering Tech Prep pathways take the COMPASS test within the first 60 days of entering the 11th grade, then secondary faculty work with counselors to eliminate deficiencies. As a result, remediation rates are lower for Tech Prep than for other traditional students, with only two out of every ten Tech Prep students requiring remediation. Researchers associated with the college's Institutional Research Office documented this result, and have continued to uncover positive relationships between Tech Prep participation and college readiness. Students who have completed the COMPASS test during high school indicate that it is an important activity in preparing them for the transition to college.

Scholarships. Yet another area of change is the Tech Prep scholarship. Scholarships to support Tech Prep students have been an attractive feature of this consortium for many years, not only the past few. Recommendations for changes in implementing scholarships were drafted in 2000-01 with the support of college administrators. In 1998, many Tech Prep programs were longer than the average programs of study, and students received \$2,000 over the course of their study at the community college, but these scholarships were not awarded until the August after graduation. As a consequence, students did not obtain the full benefit until late in their educational experience, diminishing the potential for the scholarships to serve as an incentive to get them into and through college. Recommended changes include the awarding of scholarships at high school graduation, and an increase of the award to \$3,000. A part-time ombudsman position has also been created to support students, and students are able to make direct calls to work out the details of accessing their scholarship award. The scholarships are funded through the college's foundation, with an amount set aside each year. The current scholarship fund set-aside is \$120,000, higher than the anticipated \$70,000 at this date.

Collaboration has also been extended at the high school level. The IT and English faculty work together on a daily basis to develop correlated projects and learning activities to support the development of both academic and technical competencies for IT students. All projects are jointly developed and jointly evaluated. Faculty at this school indicated that Tech Prep has provided a forum for strong collaboration of faculty, and that non-Tech Prep integrated courses are less collaboratively developed. They indicated that planning of time lines for projects happens primarily on a quarter-by-quarter basis, with rubrics for joint grading of presentations and projects outlined quarterly. Despite recent changes, however, faculty development that enhances engagement and collaboration remains an on-going challenge.

Professional Development. As indicated above, one primary means of faculty development in this consortium has been the melding of secondary and postsecondary faculty to support Tech Prep implementation. In addition to increased faculty collaboration both within the college and with their high school counterparts, counselors have been directed to insure appropriate placement of students into Tech Prep programs of study, seamless transition, and retention of students in Tech Prep at the postsecondary level.

Over the years, professional development opportunities like the Winter Symposium and Teachers in Industry for Educational Support (TIES) have abounded in this consortium, including greater participation of faculty. For example, TIES is now a 3-week externship. Business partners sustain most of the cost for approximately 70 teachers to develop instructional units to support Tech Prep curriculum development and delivery of instruction. The Winter Symposium also provides the opportunity for faculty from throughout the region to gain an understanding of Tech Prep. During this event in December 2001, approximately 250 people from throughout the greater-Dayton region attended.

One comprehensive high school in particular cited professional development through collaboration with the community college as a significant change in IT over the past few years. The school officials indicated that faculty from the college have been highly engaged in curriculum development, and that stipends have been provided to support their faculty in the

process. Summer seminars were held jointly with college faculty and, as part of these seminars, academic faculty met with their postsecondary counterparts to plan curriculum for the next year. Secondary faculty have received COMPASS test booklets to assist them in preparing students to be proficient in academic skills tests.

Counselors at one high school described some of the professional development activities as significant changes in Tech Prep over the past few years. They described luncheons where they were provided extensive information about changes in Tech Prep programs. Also, a workforce development coordinator distributed information about the IT program, the industrial engineering technology program, and the requirements for each of these programs (including geometry at the sophomore level). The coordinator also encouraged the use of career interest inventories and educated school personnel about targeted populations for Tech Prep Programs and courses.

Identification and Tracking of Tech Prep Students. Criteria for identifying Tech Prep students have been somewhat restrictive. Based on the following definition, a Tech Prep student is one who is enrolled in a sanctioned Tech Prep program, beginning in grade 11 and continuing through the associate degree in the occupational and employability competency delivery system. Teachers and counselors at the high-school level developed profiles for "ideal" Tech Prep students (e.g., students in the middle majority who intended to pursue postsecondary education), and made recommendations based on these profiles. In addition to relying on teacher and counselor recommendations of those who would perform well in a contextual, hands-on learning environment, a Tech Prep student should have passed the Ninth Grade State Proficiency Test, and must have successfully completed Algebra I with a C grade or better, have a minimum grade point average of 2.0 or better, and be at junior standing and with no academic deficiencies. Allied health also requires biology with a B or better, and biotechnology requires two science courses with a C or better, in addition to the other prerequisites. In addition to the recommendation that students have passed the Ninth Grade Proficiency Test (mentioned above), good attendance and good keyboarding skills are recommended.

Despite this rather lengthy list of requirements or recommendations in comparison to General Tech Prep programs that make no such stipulations of student participants, in more recent years as technology programs have become more viable and as Tech Prep has demonstrated student successes, student enrollment in Tech Prep has expanded in this consortium. The consortium coordinator estimates approximately 1,800 students are enrolled in Tech Prep in 2000-01, with enrollments projected to continue to rise in the future.

At one area career center, a counselor indicated that the population of students is evolving to include more college-bound students with high academic preparation. She indicated that the area career center is seeing more and more students who want to "learn to do something" beyond traditional academic preparation. She also observed that most of their students come to this center with college aspirations, and that the course offerings at the area career center provide them with a specific focus. One faculty member at the area career center described Tech Prep students as having more direction, more maturity, better decision-making skills, more motivation, and stronger academic preparation. A counselor at a second area career center

indicated that Tech Prep students are probably more vocal and more inquisitive, better prepared to take higher-level academic classes, and more ready to go out into the world and work outside of their comfort level. The counselors at this area career center indicated that they are finding above-average students who will now take classes at the area career center, and that these students perceive that the center provides them with a sense of learning "something real."

Contributors to Change

A significant advantage held by many consortia in Ohio, including the Miami Valley consortium, is that they have benefited from strategic planning and evaluation at both the state and local levels. Miami Valley has set an example in how a consortium can integrate its "lessons learned" to continue forward movement of an educational initiative. One administrator for the consortium indicated that the appeal of the Tech Prep programs is largely a result of efforts to change the image of traditional CTE, and to enhance program offerings such as the environmental science and the IT program offered with the comprehensive high schools. She cited other programmatic changes, such as moving an engineering program that had typically been perceived as blue collar to a comprehensive high school, and implementing an "academy approach." She cited the benefit of having a charismatic "champion" of the program as a key factor in its success.

One consortium administrator at the college indicated that insuring the high standards of Tech Prep programs is key to attracting strong students who might not otherwise be attracted to the community college. The opportunity for community partnerships and the provision of WBL has continued to attract students. As the consortium coordinator put it, "the nature of high school Tech Prep students has changed drastically in our consortium." Administrators and faculty indicate that Tech Prep students are more focused and better prepared for college-level study and for work than ever before.

The reasons for increases in enrollment reflect several significant factors. Since 1998, consortium leaders have held thoughtful discussions about their definition of Tech Prep, including the relative advantages of maintaining selectivity in Tech Prep programs. Being less restrictive in defining and identifying Tech Prep students was one consideration for increasing the level of participation, thereby warranting increased (or at least not decreased) budgets for Tech Prep. Another potential solution was to broaden the definition of Tech Prep, and to expand some programs that were less academically or technically rigorous. The decision made at that time was to avoid the latter, and continue to focus on high-quality programs aligned with selected high-skill, high-wage careers.

While the consortium's strategic plan to increase enrollment of Tech Prep students to 15 percent of 11th and 12th graders by the year 2000 may have been overly ambitious, the current enrollment does show important growth to approximately 1,800, up from the 748 students identified as Tech Prep in 1997. The featured Tech Prep programs continue to be high-quality programs that meet the definition of high-skill, high-wage career fields with growth potential and viable job prospects. Programs such as allied health, IT, manufacturing technology, and automotive technology are the centerpiece of the consortium.

Despite budget cuts and changes in funding formulas at the state level, the focus on quality has been retained in this consortium. Consortium administrators and business partners provide financial support for curriculum development, WBL, and professional development activities. The outcomes-based funding model continues to be used to support decision making and continuous quality improvement.

Changes in perception of the Tech Prep educational experience have also served to increase student enrollment. Students at one high school indicated that they preferred the Tech Prep program to advanced placement classes because they felt that the Tech Prep program better prepared them for college and the world of work. They felt that their Tech Prep academic courses were at least as difficult, or even more rigorous, than the advanced placement (AP) classes and that the practical experiences were extremely beneficial learning experiences. Students at one area career center felt that their home high school course offerings were too limited, and that Tech Prep opened up more options for them.

A significant factor in the implementation of Tech Prep in any state is the way that Tech Prep is conceptualized. As one local administrator described it, Tech Prep has become a "conduit for cooperation" between the state's CTE system and its elementary/secondary system. Changes in the perception of the target population have driven much of the change at the local level. While one administrator for the consortium indicated that the focus of Tech Prep was too narrow in the early 1990s, and funding was limited only to students who transitioned to programs available at the area career centers, Tech Prep has been expanded to include students who remain at their home high schools. Staff development (retraining) has been another significant contributor to changing the focus to embrace a stronger partnership with comprehensive high schools.

Faculty and administrators at one of the comprehensive high schools indicated that real change has occurred in their Tech Prep initiative as the result of counselor buy-in. As a result of extensive efforts in engaging counselors in career guidance activities, students are provided with increased opportunities for viable internships, externships, job shadowing, speakers, and mentoring. Administrators described counselors as having been "reoriented" to Tech Prep in recent years.

Faculty and staff at one area career center felt that supportive administration and a spirit of cooperation were the two most important contributors to change in Tech Prep, and in the institution as a whole. Relatively new leadership for the consortium had brought a renewed sense of importance and enthusiasm for Tech Prep that translated into increased buy-in to key concepts on all levels. Administrative staff emphasized that it had begun to focus on instructional strategies that align with the theory of multiple intelligences, and had promoted this perspective across the institution. Whereas there are differences in academic requirements for Tech Prep and non-Tech Prep students, the emphasis on academic rigor to prepare students for college is the primary focus for Tech Prep students. According to secondary school administrators, the primary difference is how they facilitate the goals of the students; Tech Prep students are those with specific ambitions to pursue postsecondary education, while non-Tech Prep students are those whose immediate goal is to pursue employment after high school.

Faculty and administrators at both area career centers also indicated that one impetus for change in their programming was the strong emphasis on career clusters, or pathways, as opposed to emphasis on specific individual programs. They described their transition to more of an "academy-type approach" that includes integrated curriculum and contextualized projects. In fact, there did appear to be definite movement to a more contextual approach to instruction.

One comprehensive high school in particular cited on-going professional development for new faculty as critical to the success of on-going implementation of Tech Prep. Particularly with high turnover in faculty at many area schools, administrators, faculty, and counselors alike see professional development as the best means of keeping the initiative alive. They also indicated that professional development activities had a positive impact on "moving perceptions of the community" about CTE.

Another factor cited by a number of the schools was the flexibility of scheduling and programming to meet the individual needs of students. Most schools have accommodated students' schedules to allow them the opportunity to participate in WBL activities, and have made other curriculum modifications and adjustments to insure that their academic requirements, as well as their technical requirements, are met.

Guilford College Tech Prep Consortium⁴

Introduction

Primary strategies of the Guilford College Tech Prep consortium (<http://www.guilford.k12.nc.us/instruction/ctpweb/ctpweb/INDEX/indexmul.htm>), located in the Greensboro, NC metropolitan area, include upgrading technical programs, promoting technical education, expanding career planning and apprenticeship experiences, and establishing transition mechanisms that encourage students to pursue a 2-year degree. Some of these goals are implemented equally among all the consortium schools whereas others predominate within particular schools, depending on the schools' needs and priorities. Broader goals of the local initiative continue to be integrated with goals of the larger workforce development effort in the region, providing stability and momentum, especially for reform of the secondary CTE curriculum.

The school district focuses on College Tech Prep programs of study and youth apprenticeship programs, more than a general Tech Prep approach. According to the consortium's *Career Pathways for Students*, 2000-01 guide, which was distributed to all students and parents in the district, "College Tech Prep is a focused, sequenced course of study consisting of 4 years of secondary and 2 or 4 years of postsecondary education" (Guilford Technical Community College, 2000, p. 3). Partnerships with business and industry are crucial to this consortium's approach to Tech Prep, as the stated goal is "to prepare students to live and work in a highly technological society by integrating academic and technical courses of study while instilling the necessity for lifelong learning" (p. 3). The Guilford County Schools and the Guilford Technical

⁴ During the time we engaged the Guilford area in the CC&B study, Margaret Terry Orr provided leadership for working with this site, and she is acknowledged for drafting the original report for this consortium.

Community College are primary educational partners in the consortium, along with area businesses, area chamber of commerce groups, and the North Carolina Department of Labor. The chambers of commerce concentrate on business and industry support for the College Tech Prep programs, and strengthening CTE programs in local growth industries. This happens primarily through youth apprenticeship opportunities and community college scholarships. Undoubtedly, a strong business and industry community and a well-defined consortium structure continue to support collaboration and provide opportunities for renewed focus within the consortium.

Major Change

Expanded Enrollments in College Tech Prep. Documentation of the number of Tech Prep students served is recorded primarily at the secondary level, based on the local definition of a Tech Prep student. The school district stresses that students are to be enrolled in one of two primary programs of study—College Prep and College Tech Prep. To graduate from these programs of study, students must complete all the course requirements. Over the past 4 years, the district has successfully reduced the number of students classified as “other,” indicating those who graduate without completing the requirements for either program of study (see Table 5).

Table 5

Distribution of High School Graduates by Type of Program in the Guilford Consortium

Graduation Year	% College Prep	% College Tech Prep	% Other	Total Number of Graduates
1997	51	13	36	2,949
1998	62	14	23	2,849
1999	62	17	22	3,005
2000	61	19	20	2,981

As a consequence of the district's policy, the percentage of graduates who completed either program of study has also increased. The figures in Table 5, however, underestimate the percentage of all graduates who are College Tech Prep completers. Students who complete both College Prep and College Tech Prep courses of study are by default only counted as College Prep completers. Therefore, the number of students who complete both, and thus could be counted as College Tech Prep, is unknown, but undoubtedly underestimated in this counting process.

The school district and community college do not track high school students who articulate from CTE programs to related community college programs, making it difficult to determine exact enrollments of Tech Prep students at the local community college. According to college admissions staff, about 18% of the school district's graduating class enroll in community college the following year, but they do not have the resources to track the Tech Prep students according to their high school major, CTE course-taking, or Tech Prep status.

Changes in Leadership. Changes in leadership in the district include the superintendent and head of the local chamber of commerce. Key staff changes include the loss of the shared staff position, the workforce development staff person of the community college, and the counterpart at the chamber of commerce. At the executive level, the district's superintendent left his position in 2000 and was replaced after several months by an individual who articulated a high priority for academic excellence. The new district superintendent made closing the achievement gap his top priority, and he brought a strong track-record of accomplishing that goal. His success as a superintendent in a similar urban area in a neighboring state was identified as a key reason for his hiring by the Guilford School District.

During the same period and for various reasons, several key staff left the primary partner agencies. For example, when School To Work Opportunities Act funding ended, the shared workforce preparation staff person retired from her position, and her work on career guidance and preparation was reassigned to other staff in the district office. The community college's workforce development staff person also left. After an extended vacancy, this person was replaced with an individual with considerable experience and knowledge of school-to-college transition programs involving articulation processes and Tech Prep. Finally, the chamber of commerce education staff person left to take a similar job in an adjoining district, and was replaced with a person who had been working in the local economic development council. Furthermore, though not as directly linked to immediate leadership responsibilities associated with Tech Prep, turnover occurred in other top administrative posts at the community college and in the high schools. For example, during the 2001–02 school year, 4 of 14 high school principals retired in the district.

Throughout this leadership transition period, the community college president and key school district staff maintained technical education as a priority. The new school district superintendent, the community college president, and the business community continued their tripartite leadership arrangement. Without question, a steadfast commitment to College Tech Prep by top officials of the community college and school district was one of the keys to the continued support of College Tech Prep. Although the community college had limited staff to execute Tech Prep, a strong commitment to future initiatives remained evident, particularly in the new staff administering the program. School district staff continued to make College Tech Prep a high priority as well, strengthening it substantially in recent years through expanded youth apprenticeships, increasing opportunities for WBL for more students, and on-going business and industry involvement through the apprenticeships and other large-scale career exploration activities.

Articulation. The tracking of student participation in articulated-credit courses between the secondary schools and community college has not been formalized, as is the case for several other consortia engaged in our CC&B study. Locally, the community college and school district define dual enrollment as when students are simultaneously enrolled in the community college and the high school. Advanced standing credit is when community college credit is earned for eligible work in a high school course that is not a community college course. Dual enrollment and credit articulation are formally established in several CTE areas, such as culinary arts (11 advanced-standing credits possible), electrical/electronics technology (14–17 advanced-standing

credits possible), automotive (16 advanced-standing credits possible upon completion of the proprietary training classes), and metals manufacturing (12 advanced-standing credits issued on the basis of a National Institute for Metalworking Skills (NIMS credential). Advanced-standing credits are also awarded in information technology; business administration-banking and finance; air conditioning, heating and refrigeration technology.

The statewide articulation agreement outlines articulated courses in 14 technical areas (e.g., metals and public service), and the local community college helped to develop this statewide articulation agreement, and has signed it. This includes all the workforce development content areas that are covered by the state curriculum. There are also a few additional bilateral agreements with the local school district, based on skill standards or mutual program accreditation. Presently, the community college promotes dual enrollment course-taking in chemical processing technology criminal justice, fire protection technology; and emergency medical science, because none is supported by the state curriculum and is eligible under the statewide agreement. The community college gives students credit (through advanced standing) for their IT and networking high school courses when students demonstrate they have passed certification exams.

Communication about these options is limited, with restrictions on their applicability, so it is not surprising that utilization is relatively low. For example, the school district's high school handbook provides rather limited information about how students can access articulated credits, so students may be unaware of all of the opportunities availed to them. The handbook does acknowledge that advanced placement (AP) credit is available in eight technical areas, which is valuable information for students and parents involved in College Tech Prep, since AP courses are encouraged. The handbook refers interested students to their guidance counselor for further information.

Obtaining community college credit for dual enrollment or articulated courses may be rather cumbersome for students, contributing to reasons that limit the numbers of students taking advantage of them. Eligible students must first apply for admissions to the community college and then apply for course credit. According to state policy, students must have earned a B or better in the course, earn a raw score of 80 or better on the Vocational Competency Achievement Tracking System (VoCATs), and be enrolled within two years to earn the credit, which then appears on the students' transcript as a "T."

District officials also note that transportation problems limit student access to and use of dual enrollment courses. Other structural problems are apparent too, particularly insufficient procedures to identify articulated courses on high school transcripts, and community college admissions procedures. When enrolling in the community college, students must self-declare that they are eligible for community college credit because of their technical course-taking, because college officials have no other means of knowing. Admissions staff reported they are too overwhelmed to screen students for the Tech Prep status because they deal with 13,000 admissions interviews and have one person processing 15,000 applications, without a mechanism in place to signal course articulation options. Part of the problem is that students can start at the community college without a transcript, and the school district does not give the college access

to records. College admissions staff explained that they were not involved in development of the College Tech Prep program when some of these issues could have been worked out, so continuing issues around handling College Tech Prep students matriculating to the college exist via admissions policies and procedures.

Furthermore, concerns of the school district that sharing student records would violate Family Educational Rights Privacy Act (FERPA) have slowed information-sharing between the district and the community college. This includes sharing of information so that the community college can contact graduating seniors who have completed CTE courses of study. Also, school district officials do not want to create what might appear to be an exclusive relationship with the community college with respect to College Tech Prep because parents in the district urge the schools to keep college options open. A state-level computer program to automate collection of follow-up data for Tech Prep student transition does exist, but this system identifies Tech Prep completers from high school who are already enrolled in the community college within 2 years of graduation. It does not help the community college communicate better with Tech Prep high school seniors and recruit them into technical programs. On the other hand, within a relatively short time of being hired, the college administrator who has primary responsibility for College Tech Prep has worked closely with the district's high schools to make counselors and parents aware of the new career pathways. This college administrator has worked diligently to develop College Tech Prep scholarships, pursuing aggressive strategies to make high school students and parents aware of them.

Tech Prep Scholarship. Local business councils raised funds for several scholarship programs for College Tech Prep completers in their technical areas who continued their studies at the community college. The community college's scholarship program started in 1999–2000, and it is known as the College Tech Prep Tuition Assistance program. It was developed by the community college's president, and is to cover tuition and fees for the first 2 years of community college for any College Tech Prep student who continues his or her technical program of study at the college. Eligibility criteria for the assistance program specify that "upon entering college, applicants must honor the crosswalk from their high school pathway to the corresponding college program(s)," and the "crosswalks" are spelled out so that students understand the college's expectations. Students who switch to a college transfer program are not eligible, nor are students who qualify for a Pell Grant. However, students who are awarded other scholarships and awards may still apply and qualify.

This tuition assistance program includes scholarship funds donated from the community college (the college put \$100,000 from its bookstore funds into a scholarship foundation for Tech Prep students) and industry, and from the community college foregoing their fees. So far, this scholarship program has been under-used, but school and college administrators are optimistic that heightened marketing within the high schools will yield more students in the future. Even so, some college staff expressed skepticism about the merits of the scholarship, suggesting that applying may be more burdensome than paying the college's already-low tuition rate. (As of spring 2001, the college charged only \$27.50 per credit hour.) Local school district officials disagree, pointing out that the application is a short, one-page form that can be completed by

students in a manner of minutes. School counselors fill out a portion of the form as well, but the information they provide is also quite brief.

Curriculum Reform. The consortium's Tech Prep initiative has been developed in three primary strands—curriculum integration career-focused programs of study through career pathways and youth apprenticeships and a career guidance program. Some of the initial curriculum-development work focusing on academic and CTE has waned in recent years, after the initial professional development and curriculum reform efforts were completed. According to one community college official, one reason curriculum development has been difficult is because the secondary education curriculum is often defined at the state level through curriculum frameworks and high-stakes testing. The secondary schools have limited discretion in revising what is taught, whereas the community college curriculum is much more locally developed, often in collaboration with business and industry.

According to the district's career pathway guide, "at the core of the College Tech Prep program are 11 'career pathways' that have been developed with the help of more than 200 area businesses. These pathways utilize industry-specific curricula in an academically and technologically intensive learning environment to help students prepare themselves to be successful in the highly competitive 21st century workforce" (Guilford Technical Community College, 2000). The 11 career pathways are

- Automotive technology
- Banking and financial services
- Chemical and process manufacturing
- Construction technology
- Culinary arts
- Electrical/electronics technology
- Heavy equipment and transport technology
- Heating, ventilation, and air conditioning
- Information technology (IT)—electronics, network administration, network engineering, telecommunications
- Metals manufacturing
- Public service

The consortium created business advisory councils to develop each area and create youth apprenticeship experiences. The consortium also works on improving training facilities, equipment, and teaching staff, and developing student interest. Each program of study is based

on national standards wherever possible, including NIMS, Novell/Microsoft National Automotive Technicians Educating Foundation (NATEF), and A+ certification. Through their curriculum work, the consortium developed standards for technical preparation that revised both local and state requirements.

IT is a new area of focus for the consortium. The district is one of nine sites in the nation's Building Linkages project on Information Technology (IT), supported by OVAE, USDoE. This initiative is funded by federal Perkins funds, state maintenance efforts for CTE, and donations. The school district is only offering three career paths, and has been creating the program by stipulating course sequences, creating an item bank (for testing), developing VoCATs, linking to national skills tests, and using the state's blueprint for IT programs.

High School and College Reforms. The school district has also continued to actively participate in the high school reform effort, High Schools That Work (HSTW). This effort fosters career planning and curriculum integration in the high schools, through workshops and other support. It includes career guidance and ninth-grade transition planning. District officials describe this model as complementing its College Tech Prep program; 12 of its 14 high schools now participate. The district's commitment to this model has paid off, with consistently increasing reading, math, and science test scores from 1996-97 to 1998-99. According to local evaluation evidence, the district's students equal or outperform other students in HSTW programs statewide and nationally in reading and math. Thus, the district has found that the model helps to improve student achievement, especially on the state accountability measures.

The school district is starting two middle-college programs, one with a local private 4-year college and the other with the community college. The community college will serve 11th and 12th grade students through combined postsecondary courses, and a core high school program offered by public school staff. The program is to target bright, under-performing students, and offers a small high school program in a college setting. It is modeled on the middle-college programs in Tennessee and Michigan, and has begun with its first two cohorts in fall 2001. In 2001-02, 100 students are enrolled in this innovative program and are taking their courses at the college.

Scheduling difficulties, in part, drove the program design. The community college has limited extra classroom space to dedicate to the program, except in the middle of the day, and is interested in emphasizing the connectivity to transition to college. Students can enroll in morning or evening courses at the community college, and take their high school courses mid-day. The program will be limited to 15 students, with seven teachers, a principal, counselor, and secretary. The community college workforce preparation staff person will be the program's liaison to the college and its resources.

The community college recently raised students' eligibility requirements for placement out of developmental courses. They find that high school graduates and adult learners perform the same on their tests—with 80% needing algebra and 50% needing remedial help in pre-algebra. They also found that students who coasted with low math grades in high school often end up in the colleges' developmental math.

The school district had planned to use block scheduling as a basis for further school reform and to support CTE course-taking through their area career center. They did extensive training with an expert, and undertook 3 years of study and planning to implement a 4x4 schedule and coordinate schedules with the district's career center. When the new superintendent was hired, district staff had begun full-district block schedule adoption for the coming school year. The new superintendent, in response to some school and parent complaints, changed the mandate to allow each school to select its own scheduling plan. As a result, 10 of the 14 high schools decided to adopt a 4x4-block schedule; two selected the A/B block schedule; and the remaining two schools are using a six or seven period school day, although both schools' principals advocated block scheduling. One consequence of this schedule variation is a difficulty in having students attend CTE classes at the career center or at other high schools in this district.

Youth Apprenticeships. Through the College Tech Prep program and the consortium's workforce preparation efforts, 10 youth apprenticeship programs were created, including requisite high school coursework, competency-based work experience, and postsecondary education. These programs are treated by the school district as a subset of College Tech Prep, wherein "high school students, enrolled in the College Tech Prep program, can apprentice in their junior and senior years in their chosen career field as part of the Apprenticeship Program sponsored by the U.S. Department of Labor. Students work part-time during the school year and full-time in the summer. Because class work is coordinated with appropriate technical training, these apprenticeships provide students an excellent opportunity to apply classroom theory directly to the job" (Guilford Technical Community College, 2000, p. 5).

The program is overseen by a school-district youth apprenticeship coordinator and a community college coordinator who guide students through the articulated experience. To support this program, the school district and state Department of Education created an integrated youth and adult apprenticeship registration process, which outlines all the training needed and creates a seamless pathway between secondary and postsecondary education. To complete the entire program, students need to continue their postsecondary education at the community college as part of their contract and as the intended postsecondary placement. Although the program is formalized, students have the flexibility to move in and out of their apprenticeships as they progress from high school to college or work.

The district's high school handbook outlines the availability of and criteria for College Tech Prep, which apply to all of the youth apprenticeship programs. It notes that the apprenticeship program has common academic and attendance standards, in addition to requiring at least a 2.0 grade point average (GPA). Only students who are completing a College Tech Prep course of study are eligible for the youth apprenticeship option. Students receiving high school credit and grades for their youth apprenticeship performance can transition into an adult apprenticeship program or a college program.

The apprenticeship programs are structured according to standards-based competencies that are articulated between the youth and adult apprenticeships. Each is designed as a complementary educational experience that does not compete with other high school experiences. Thus, employers will adapt the work schedule to allow students to take other

requisite courses or participate in extra-curricular activities while completing their apprenticeship competency requirements. Students receive a starting wage of about \$7.50 per hour or slightly more, and employer sponsors may differ in the rate and amount of raises. This arrangement minimizes initial wage competition for apprenticeship placements.

The number of students in apprenticeships has increased over the last 3 years, from 85 in 1998–99 to 112 in 1999–2000, while the number in cooperative education has declined. In addition, the total number enrolled in WBL experiences increased overall, from 832 to 945, with internships increasing from 245 to 469 over the same period.

When applications are submitted, the coordinator reviews them to see if the students have the course credits, GPA, and the requisite academic and technical requirements, and is interested enough in the career area to be a College Tech Prep completer. The students are initially placed in the summer before their junior or senior year (depending on the apprenticeship requirements), especially in the construction trades in which students cannot work during the school year but must concentrate during the summer.

Most of the high school graduates who had participated in youth apprenticeships said they wanted to continue. About 70% stayed in the field, either working, attending the community college, or pursuing other options. In the 1999–2000 school year, 89% completed the youth apprenticeship program and followed through; 49% stayed with their company and enrolled in postsecondary education (most likely at the community college); 18% pursued a community college degree program without the apprenticeship component; and the rest continued working without postsecondary education, or were undecided.

The school district is continuing to expand its youth apprenticeship programs, having just started one youth apprenticeship program in early childhood education, and planning to start one in pharmacy technology with a local drug store chain, whereby students will be certified as pharmacy assistants. In fact, the district earned two statewide youth apprenticeship awards in 2001–02—one outstanding trainer award (in construction); and an outstanding youth apprenticeship in IT. In fact, the district has had winners every year.

Cooperative Education. In addition to the youth apprenticeship option, a key component of the College Tech Prep program in this region is cooperative education or co-op. According to the Career Pathway Guide, 2000–01, “the co-op program is designed to integrate classroom theory with a practical, career-related, work-based learning experience” (Guilford Technical Community College, 2000). Co-op is seen as a way for students to supplement their academic education through opportunities for professional development. Students who participate in co-op earn substantial wages, averaging nearly \$10.00 per hour while working an average of 25 hours per week. Nineteen programs require co-op, including automotive, chemical processing, civil engineering technology, and emergency medical science, and 20 programs offer co-op as a course-substitution option. Plus, 22 college pre-major programs offer co-op as a career exploration opportunity.

Business and Industry Involvement. The business and industry community itself has maintained a strong commitment to local workforce development and preparation through

improved secondary school and community college programs of study. The centerpiece has been the youth apprenticeship programs, through which they can provide input on curriculum, training opportunities, and scholarship programs, to encourage advanced CTE. As a result, the countywide operations committee has continued to be strong, with on-going support of school district officials, even when a community college staff person was not present. Other countywide subcommittees of the Workforce Investment Council (WIC) are not in operation. The chairs of the 11 industry councils, the chamber of commerce workforce development representatives, the school district and community college directors of workforce preparation, and other school district staff attend a monthly meeting to discuss operational/implementation issues such as marketing and internship opportunities.

With the addition of the new staff liaison person from the chamber of commerce, the workforce development operations committee and the business advisory councils have been substantially strengthened, through improved organization, communication, and purpose. The staff liaison was instrumental in shifting the groups away from information sharing to more substantial curricular matters, such as visibility and utility of the work of these groups.

STW and Career Guidance. College Tech Prep requires a variety of career development and guidance activities that will help students become aware of the full range of career options, make informed career choices, and select a career focus. Each College Tech Prep student must have an Individualized Career Plan (ICP). Although not well-defined by the consortium's College Tech Prep initiative, career guidance is included in

- the high schools' HSTW programs
- the district's adoption of InfoTracker™
- the annual career guidance counselor sessions at the community college
- the business councils' recruitment visits to the high schools to interest students in different career fields

Local guidance programs and services were integrated into the school district's College Tech Prep operation when STW funding ended, and a shared staff position was eliminated. School district officials continued to inform guidance counselors, through professional development and visits to the community colleges, of CTE courses of study available at high schools and at the community college. They also stressed the importance of counseling students to complete either the College Prep or College Tech Prep courses of study. Guidance counselors were key to explaining the course and program articulation options to students.

Marketing and Image. Program marketing is challenging for the school district and community college, but recent developments have addressed this concern. The business advisory councils have developed extensive video and print materials to promote their industries, the employment opportunities, and the secondary and postsecondary courses of study. The consortium developed a web site to promote the courses of study, and is planning on-line video streaming of the council's video materials. District officials estimate that they have spent

\$200,000 on marketing. In addition, the business advisory councils make structured school presentations to promote their fields, the courses of study, and youth apprenticeship opportunities.

From the perspective of school district and community college staff, parents and guidance counselors underestimate the value of career opportunities associated with College Tech Prep. Nevertheless, the high school course handbook and community college course guides provide information to parents and guidance counselors about the program, but articulation arrangements, dual enrollment options, and youth apprenticeship opportunities are not explained well and are difficult to locate in the pertinent printed materials. Even the program materials developed by the business advisory councils do not explain the program articulation options between the high schools and community college programs of study.

Professional Development. At the community college level, early efforts at professional development for curriculum integration on academic, technical, and employability skills were well received, and some curriculum integration work has continued. Through its implementation, the community college faculty and officials saw a need to improve assessment of cross-functional skills and in making competencies explicit. The community college is now training its faculty in the use of the Wisconsin Instructional Design System (WIDS), a performance-based platform to support instruction and assessment of cross-functional skills. Guidance counselors may be eligible to participate in the secondary education and community college professional development, but there is no separately targeted professional development for them.

At the secondary level, Tech Prep-related professional development has not been conducted since a joint in-service of secondary education teachers and community college faculty that culminated in a study trip to Europe. At the secondary level, the state's accountability plan has dominated the district's professional development, and teachers are not allowed to give up classroom time for collaborative activities. An exception is the school district's professional development activities, conducted through HSTW.

In addition to these efforts, the school district has directed a substantial amount of resources to enhance the technical ability of CTE instructors, particularly at the secondary level. For example, during 2000, instructors who teach autocad™ participated in technical in-service opportunities. The upgrading of secondary-level technical labs has also been emphasized, including compensation for teachers who committed to work after-hours and on weekends to support laboratory enhancements and lesson plan development.

Contributors to Change

Based on our interviews and other information, there seemed to be four contributors to the consortium's implementation of College Tech Prep in the past few years. First, an initial superintendent and a committed community college president were solidly behind CTE reforms using the College Tech Prep model, and these leaders were supported by sustained staff leadership, particularly within the school district. Added to this educational core, local business and industry concerns worked together to promote secondary education improvements centered around improved CTE programming. The state's College Tech Prep policy reinforced these

secondary education improvements, enabling the school district to implement academically-demanding career pathways for high school students, thereby making CTE a viable alternative to traditional College Prep.

Even with these impressive developments, change moved slowly when administrative personnel at the secondary and collegiate levels turned over. Most notably, the loss of the district's school superintendent, who had made CTE improvement a cornerstone to local education improvement, contributed to a slow-down in momentum until the new superintendent became knowledgeable and ready to take on a more visible leadership role. At the college, the loss of the College Tech Prep advocate diverted attention from the initiative until the position was filled. Indicative of any personnel change of this magnitude, it took time for new leaders to understand the goals of College Tech Prep and commit to them. Even so, continued progress was evident in important areas, such as a strengthening of the consortium's signature youth apprenticeship program, the creation of an innovative middle college, and increasing WBL opportunities for more youth.

Second, both the school district and the community college wanted to capitalize on business and industry interest and develop input for their programs, to improve their satisfaction with their graduates as future employees, and to garner more local public support for educational funding. As a result, they wanted local business and industry to help define local growth industries for future career preparation, provide input on curriculum and instructional improvements, and provide equipment and other forms of support. Thus, the two institutions (along with the chambers of commerce that wanted to strengthen the local workforce as part of local economic development) worked aggressively on developing business and industry involvement and supporting their participation through the Workforce Investment Council, its operations committee and the business advisory councils. This infrastructure, in turn, helped to sustain local efforts when the three primary partners experienced turnover in key staff and leadership positions.

Third, articulated pathways between secondary and postsecondary education became more formalized within the consortium, though student participation in these pathways was difficult to assess. However, other priorities—curriculum improvement and integration efforts, professional development, strengthened business participation, youth apprenticeship programs creation, and marketing—were evident and central to the College Tech Prep initiative. Program articulation across multiple programs of study between 14 high schools and the community college's various majors and degree programs has been a difficult goal to achieve. As a result, articulation continues to be facilitated by individual secondary teachers and community college faculty members, sometimes at the urging of students and parents themselves.

Fourth, combining College Tech Prep with other workforce preparation goals and initiatives, including CTE reform and STW, has both facilitated and hindered the implementation of College Tech Prep. By combining the work of multiple workforce preparation reforms, the partnering institutions and agencies could make workforce preparation a high priority locally and attract broad-based business participation and investment. The success of this strategy is reflected in the financial and in-kind contributions, and the well-developed career pathways, courses, and youth

apprenticeship opportunities. Yet, by combining reform initiatives, the consortium may have overlooked some of the unique features of each reform particularly the system-changing aspects of Tech Prep to form clear, articulated pathways of study between secondary and postsecondary education.

San Mateo Tech Prep Consortium

Introduction

The San Mateo Community College District in California (http://canadacollege.net/services/high_school.html) is composed of three colleges that are equal partners in the same Tech Prep consortium. Funding flows through the consortium's central administration at the San Mateo district office. The district applied for funds under Perkins III as a single consortium beginning in 1998. The consortium's primary goals focus on promoting students' awareness of career and further education opportunities. Local personnel understand that Tech Prep has value in better preparing students for the workplace and for college, and that it helps to keep students in school and awaken in them the possibility of going to college. To accomplish this broad objective, Tech Prep has traditionally focused on strengthening the connection between schools and School-to-Work (STW) activities.

Tech Prep has also focused on developing integrated curriculum, WBL experiences, and the Secretary's Commission on Achieving Necessary Skills (SCANS), and enhancing professional development and industry involvement. The connection between Tech Prep and STW has resulted in parallel goals. Tech Prep has been under implementation longer than STW, but they share an emphasis on academic standards, career, guidance, and parental involvement. These goals continue to receive emphasis in the consortium. State initiatives have increased academic standards, bringing high school requirements more in-line with the requirements of the University of California system. The result of this increase in standards, as will be seen, is that Tech Prep continues to thrive, while STW has begun to wane.

Major Changes

Articulation. Articulation agreements have historically been an important catalyst for change in the secondary schools in the San Mateo consortium, and continue to be one of the primary features of the Tech Prep initiative in this region. Articulation is established on a course-by-course basis between the high schools and the community college, through the use of a Tech Prep certificate, which records an entire year of work. Students are identified as Tech Prep when they have successfully completed articulated CTE courses. They complete a high school CTE course, take a test, and then, after going to the community college and completing six credits, their high school Tech Prep certified courses are granted community college credit. The high school fills out a petition, which is then entered on the college database.

In fact, students at one common campus no longer have to pass special exams that verify competencies; these have been eliminated, in part because of enhanced trust among faculty in the quality of education that students receive. At the other colleges, however, the exam is still

administered. At one college in the district, the preference is that the high school teachers administer the exam, in order to give students more confidence; at another college, faculty initiated the exam and continues to administer it to in-coming students. The impact of this exam on the frequency with which students access articulated credit at the community college is unclear, but since the credit hours are so inexpensive (\$11/credit), the exam may represent somewhat of an obstacle. Still, the Tech Prep coordinator at one college has the impression that students take the test seriously, so it may serve to encourage those who do well to approach their community college experience with confidence.

The articulation system has undergone changes as a result of the 1998 reorganization of the consortium. Tech Prep funding made articulation possible in this consortium, and articulation councils originally reviewed all articulated curriculum, and subsequent adaptations and revisions, as well as the agreements themselves. Agreements are now district-wide and correspond to career pathways, and school superintendents work directly with the community college. Because articulation took place at the high school level, it caused the consortium to examine more carefully how articulation works at the department level and to encourage collaboration between secondary and postsecondary educators.

Two concerns are evident. First, there is an effort to create articulation agreements for all career pathways; second, the consortium finds that Tech Prep students do not seek their credits after graduation from high school, and that some value could accrue by tracking these students more closely. Even though collaboration from the high school and community college faculties has become increasingly significant, the college needs to keep track of students once they arrive and help them obtain articulated credit.

The consortium is presently updating its articulated courses. High school and community college faculty have established good lines of communication that allow them to expand the number of agreements. They believe that their ability to work together and to maintain "continuous communication" is helpful to the student. Now that the agreements are accepted district-wide, the current focus is to develop agreements that correspond more precisely to the locally identified career pathways. Articulation agreements do indeed cross boundaries within the consortium, so they lead students to any of the three community colleges. For example, all three colleges have agreements so any high school can articulate its coursework to any college.

Career Clusters and Pathways. Career pathways have become a central feature because administrators have long recognized that educational initiatives in California are labor-market driven. Career pathways differ from traditional 2+2(+2) models because they have not relied extensively on articulation. However, as articulation and career pathways are tied together, they sometimes resemble traditional models. Career pathways were identified in the 1998-99 Tech Prep grant application as the basic high school restructuring format. The creation of eight career pathways was a major objective of STW, which supported the idea of seamless transition from high school to the county's community colleges. STW funding was provided and professional development opportunities were arranged for administrators, teachers, and counselors, in order to initiate the implementation of career pathways. Now, the automotive technology program is considered a 2+2 model, and engineering is considered a 2+2+2 model, suggesting that career

pathways are slowly developing into more traditional models. Statewide pathways include CTE courses, but are considered too broad to be truly effective. The creation of new pathways is not uniform throughout all high schools. Since articulation has traditionally been course-to-course, it has not reinforced the implementation of career pathways. Also, because career pathways, like the STW and Tech Prep initiatives, have relied on student access to electives, the recent increase in graduation requirements has made it difficult for students to find time for CTE coursework.

School-to-Work. School-to-Work has weakened throughout this consortium in large part, possibly because of the reauthorization of Perkins legislation and the consortium's reorganization that created a streamlined consortium when applying for Perkins III funding. This change in administrative structure inhibited the alignment between Tech Prep and STW that was already in progress. These organizational changes were accompanied by new initiatives from the state, designed to increase academic performance and bring high school requirements more in-line with the requirements of the University of California system. As noted above, the larger combined consortium could disburse the benefits of Tech Prep more widely throughout the district, especially the benefits of articulation agreements corresponding to district-wide career pathways. Tech Prep's ability to bring high school and community college faculties together for collaborative development of curriculum was also a major advantage that STW could offer.

Tech Prep's longer history in the consortium, ability to bring value through articulation and curriculum development, and continuing funding, placed it in a stronger position than STW to support the newer state focus on raising academic standards. The STW effort was under-funded at a crucial juncture, and could not provide sustained support for the new academic standards; neither could it influence faculty. STW funding was not getting to the teachers and classrooms in one community college. In fact, it appears that STW funding ended abruptly and, with its momentum broken, STW leadership departed from the schools, and the initiative began to disintegrate.

Still, STW continues to enjoy support among counselors who believe that it should be connected to career pathways. If implemented properly, local administrators thought that STW should have a dedicated counselor on-site who could instill new thinking in the schools about career education. Many high school counselors, according to one special projects coordinator, believed that high school is too early to introduce students into STW concentration, and that STW should be part of connecting career pathways with the community colleges. Yet community colleges have seen little evidence of STW. Only under the most recent coordinator have changes started occurring, but when she leaves, those changes may dissipate or become absorbed by other initiatives. Widely perceived as too broad and amorphous, STW is expected to disappear entirely in time.

Raising Academic Standards. Raising graduation requirements in high schools is a priority for the state, motivated by the inclusion of entrance requirements of the University of California system. The increased standards suggest that students in the high schools are bound toward the 4-year university, and that graduation equals college entrance. The increase in graduation requirements at San Mateo clashed with other initiatives such as STW and Tech Prep, because students became limited in their elective options. Local Tech Prep personnel considered that the

increased standards represent a downward pressure by the university to reduce or "push out" Tech Prep. But Tech Prep has been able to respond to these new standards at the local level, and students have been able to use their Tech Prep credits as electives.

More specifically, California has created its own high school exit exam (STAR) given to students in the 11th grade, which is used to rank schools and focus intervention on under-performing schools. This exam has impacted the opportunity for students to use elective credits because of the need to intervene in those schools that do not score well on these exams. The availability of elective credits is crucial to successful integration, and to maintaining a low drop out rate among special populations, Tech Prep students, and students in English-as-a-Second Language (ESL) programs. For example, Tech Prep has been able to accommodate new requirements, such as drafting and architectural design programs fulfilling arts requirements of the University of California. Some concern is expressed, however, that the increased graduation standards, and the implementation of the exit exam, will limit the number and quality of articulation agreements. There are, some say, "only so many hours in the day." Having said that, however, one administrator believes that Tech Prep has prepared students to meet the increased standards. She claims Tech Prep students are advanced in skills, which will place them in higher courses, and are more motivated and focused than other students.

Marketing and Image. The combined effect of the administrative and organizational changes, the Perkins III legislation, increased state requirements for graduation, and the demise of STW has led to a strengthening in the reputation of Tech Prep. Local leadership identified the earlier image of Tech Prep as problematic because it was tied too closely to CTE, and because of the difficulties associated with modifying school schedules and curricula, and attracting funding and personnel. It was seen as difficult to attract teachers and students to applied academics courses. Now, local leaders claim to see an improvement in the image of Tech Prep because, even though pressures exist to eliminate or reduce its impact, it has successfully contributed to a decrease in drop-out rates. Though the booming economy tends to draw students out of school and into the workforce early, Tech Prep has resources to offer students valuable technical education, and continues to be attractive to first-generation college students and minorities. Tech Prep is perceived as increasing among new college entrants, and it gives colleges an incentive to enroll their sons and daughters into college. The increased likelihood of successful completion of high school and entry into college also has the effect of bringing better students into community college technical programs. This is significant to the future because student demographics are changing. More minority and first-generation students seek a route to college using Tech Prep. Local leaders also see an increase across the consortium in student dropout rates as more Hispanics enter the school system. Tech Prep, with its ability to reduce the drop-out rate, is thought to offer options to remain in school.

Contributors to Change

Fundamental change has occurred in this consortium over the last couple of years. The reasons for these changes seem to be a combination of social and economic factors that have had a real impact on education, the reauthorization of Perkins legislation, state-imposed initiatives impacting graduation standards, consortium-level reorganization, and shifts in emphasis in CTE away from STW. Local leadership has given direction to some of the changes in the consortium, such as the superintendent's leadership in the construction of career pathways to the community college. STW leadership, however, has generally vacated the consortium through retirement or loss of funding. Tech Prep leadership, on the other hand, remains in place and relatively strong.

Changes in articulation have come about because of the reorganization of the consortium, which has allowed greater use of articulation agreements among all three of the county's community colleges. Articulation agreements in areas such as auto technology and business cross college boundaries. Local nurturing of communication and collaboration between secondary and postsecondary instructors has created changes in how articulated credit is processed for students, in terms of how the certificated credits are assigned, and how and whether exams are administered. The continuing viability of articulation agreements may also have contributed to the vitality of Tech Prep in the face of pressures from their university system's increased graduation standards and the economy. The articulation process has been beneficial in supporting a management information (tracking) system for students, as they petition for credits, verify competencies through exams, and then pursue college credits. The increasing value of articulation is further reflected in the fact that schools that did not previously have an interest in implementing Tech Prep are attracted by the advantages of the Tech Prep articulation agreement.

Students also recognize the value of these agreements, but not in overwhelming numbers, which may be one fundamental reason why articulation agreements are not put into place within the current career pathways with greater speed. Some decry this as the "myth of articulation." For example, in one instance, students from one high school had claimed only 100 out of 400 credits. Still, articulation seems to facilitate the primary goal of getting students into college, and this certainly would explain why local personnel continue to view the articulation agreement as a fundamental attraction for new Tech Prep students. A growing emphasis on aligning articulation agreements with the current career pathways may have a considerable impact on the use of articulation agreements in this consortium in the future.

Like articulation, the changes in career pathways have been the result of the reauthorization of Perkins legislation, and the subsequent reorganization of the consortium. The larger consortium has sought to tie the articulation agreements to the career pathways. Also pertinent has been the gradual de-emphasis of STW, concurrent with the increase of high school graduation requirements that negatively impact career pathways by placing restrictive limits on the number of electives students can pursue, which has perhaps fostered the interest in tying articulation agreements to the eight career pathways. It is notable that the district superintendents hope to create career pathways to the community colleges, which suggests that future development of career pathways will continue to benefit from tying into articulation agreements.

Another contributor to the decline of STW has been the differing quality of school-level involvement between STW and Tech Prep. In addition to the strengths listed above, Tech Prep created teachers committed to it, whereas STW only provided a coordinator for each school and limited staff development. Thus, without significant funding, without significant presence in the schools, and without reform ideas moving forward in other forms, STW lost momentum. Furthermore, Tech Prep was in a position to respond when the superintendent wanted to mobilize district resources in order to implement the state's new graduation requirements. Apparently, high school academic teachers considered STW too vocational.

STW may have been an unintended victim of a booming economy. The fact that students could find work with relative ease may have left STW without a purpose, from the local perspective. There was no need to have a mechanism by which to place students into jobs because students were able to find work on their own. STW-level job shadowing and WBL experiences became somewhat redundant in this context. Some local personnel indicated they believed that STW was too slow, and did not have the momentum and innovativeness of Tech Prep. Ultimately, some saw Tech Prep as a model for STW, and considered STW's successes to be primarily the result of Tech Prep.

The success of Tech Prep can also be seen when we consider the impact of state-imposed increases in graduation standards. These new initiatives include STAR testing, and the inclusion of the art requirement at the University of California system, with high schools responding by increasing their graduation standards. The state of California has imposed its own high school exit exam, and schools focus on this test and how to implement it. The impact of these state initiatives has been primarily on electives, which have been something of a sacred cow for high schools as one of the primary ways to retain students in school and maintain low drop-out rates, as well as to accommodate special education and ESL students. Tech Prep has shown some flexibility in the face of this conflict by transforming some programs to meet university requirements, such as the art requirement (1 year of art).

The image of Tech Prep has improved because it is seen primarily among parents and students—but also among schools considering implementation of Tech Prep—as a beneficial means of keeping students in high school, transitioning them into college, and providing them with a sound education. Articulation is a large part of this attraction, providing courses that can be equated with AP courses and allowing students to avoid retaking classes at the college level. According to community college officials, parents still express resistance to Tech Prep, preferring their children steer toward the 4-year options, but Tech Prep leadership perceives more awareness among parents of the value of Tech Prep.

From the perspective of the community college, this growing awareness is a recruiting tool to provide incentive for parents and students to consider the community college option. This improving reputation is most likely the result, in part, of anecdotal evidence of success that is used in marketing efforts. For example, as told by a county Tech Prep coordinator, a Hispanic couple is proud of their daughter who received a Tech Prep certificate, and subsequently became ambassadors for Tech Prep with other Hispanic and minority groups.

Similar success has not been seen among business and industry stakeholders, however, due in large part to the nature of the economy, but also to other factors. The relationships among community colleges, secondary schools, and business and industry is shaky. As a result, the secondary and postsecondary schools find it difficult to replace outdated, expensive equipment, and to purchase new equipment to teach new technologies. Business and industry in this region is well-established and diverse, but it requires a high concentration of skilled workers, whereas the local population of skilled workers is decreasing. As reflected at the secondary level, this decrease means fewer young families with children; the school district lost 1,000 students last year. The school system in California does not provide employability skills (via SCANS) in the K-12 curriculum, and is, therefore, less useful to business and industry. A result of this is that the WBL component is not rich, and the professional development opportunities for faculty have not been forthcoming. In fact, there has been a shortage of CTE faculty available for both the high schools and community colleges.

Overall, the changes in this consortium have reflected the developing economic and demographic situation in the region. Though Perkins has allowed certain organizational changes to take place at the consortium level, it seems that economic factors continue to diminish the Tech Prep initiative by denying it the lifeblood of business and industry participation at a full level. Tech Prep leadership, the community, business and industry, and the high school and community college faculties do not appear to want the same objectives; at least, unified objectives have not been expressed. It appears that this Tech Prep consortium is weathering some significant storms, even as it attempts to continue to stress fundamental principles such as articulation, raised graduation standards, and the creation of viable career pathways.

CROSS-CONSORTIUM CONCLUSIONS AND RECOMMENDATIONS

This study has examined implementation Tech Prep in 8 selected consortia in the United States, with particular interest in major changes and contributors to those changes over time. For the purposes of this investigation, a *major change* was identified as a shift or alteration in policy or practice that was evident to multiple stakeholders during the period since federal vocational legislation (Perkins III) was passed in 1998. In addition to major changes identified by local personnel, our data collection teams looked for major changes based on their own understanding of past policy and practice. Changes were identified based on prior evidence presented in the Bragg et al. (1999) report, combined with our research teams' first-hand knowledge of the consortia over time. Cross-consortium results are emphasized in this section, and Table 6 indicates the major changes evident, by state where each consortium is located. In all but two cases, the same research team that collected data in 1998–99 conducted the follow-up visit during the 2000–01 academic year, providing a valuable external, long-term perspective. In addition to the site visits, we maintained communication with the consortia via e-mail, telephone calls, and other correspondence and communiqués, providing further insights into developments occurring over the entire period of the study, from January 1, 1998, (and in some cases prior to that time) to December 30, 2001.

Besides identifying changes in the local Tech Prep initiatives, each case recognized contributors to change. These contributors aligned closely with Fullan's (2001) interactive factors affecting implementation. As such, in this section dealing with cross-consortium results, we used categories identified by Fullan to organize conclusions. Specifically, conclusions about contributing factors focused on characteristics of change, local characteristics, and external factors. In addition to these conclusions, recommendations were offered that dealt directly with the 8 consortia under investigation, offering lessons to other Tech Prep consortia in the nation. Consistent with qualitative research, it is important for readers to discern the significance of results for their own situations. Especially when results are consistent with the growing body of literature on Tech Prep implementation, conclusions and recommendations offered here may be relevant to policy and practice on a wider scale.

Table 6

Major Changes by Consortium

Themes Associated with Major Changes	IL	Met	OR	TX	FL	OH	NC	CA
Articulation	X		X	X	X	X	X	X
Curriculum reform/integrated curriculum	X	X	X	X	X	X	X	
Career clusters, pathways, and academies	X		X	X	X		X	X
Raising academic standards and assessment	X	X	X	X		X		X
Work-based learning/youth apprenticeships	X				X	X	X	
School-to-Work (STW)	X			X	X			X
High Schools That Work				X			X	
The role of the community college	X	X			X			
Business and industry involvement	X		X				X	
Identification and tracking of Tech Prep participants	X			X		X		
Professional development		X			X	X	X	
Changing student demographics			X	X				X
Tech Prep scholarships					X	X	X	
Marketing and image							X	X

Changes in Tech Prep

Legislated Changes. The essential elements of Tech Prep in Perkins III (1998) were virtually identical to Perkins II (1990), suggesting less of a redirection or shifting of foci, and more of a deepening of previously specified reform ideas. Fullan (2001) would seem to support the idea of a consistent approach to reform because of the importance of having a clear and sustained implementation process. Notwithstanding, Perkins III offered some new concepts, including greater emphasis on changing instructional strategies at both the secondary and postsecondary levels. Contextual learning and work-based learning (WBL) were mentioned in the new legislation as important for both levels of education. These ideas were not mentioned explicitly in Perkins II, but an emphasis on applied academics and encouragement for business and industry to be involved in consortium partnerships was emphasized.

An added element of Perkins III dealt with articulation agreements, specifying 2+2 Tech Prep programs articulated with baccalaureate-degree programs, creating 2+2+2 options. The idea of CTE as a part of a high-school-to-college transition option, or preparing students for bachelor's degrees, was a particularly important departure from prior federal vocational education legislation. Looking back to the Smith-Hughes Act of 1917, vocational education endorsed by the federal government has been limited to the sub-baccalaureate level (Wirth, 1992), so offering an educational option extending through the baccalaureate degree is a landmark development. Though mostly unheralded, this provision represents a departure from the past that may be particularly important to the future of CTE.

Another change of significance in Perkins III was an increased emphasis on accountability. Ambiguity about whether states should report performance results for Tech Prep was removed when Perkins III specified that state-level reporting was a requirement. The OVAE, states and professional associations such as the National Association for Tech Prep Leadership (NATPL) began serious discussions conceptualizing ways to report student enrollments and outcomes (Elliott, 2000). Difficulties continue to exist for state agencies to know how best to document student participation, but more importantly to measure its impact. Historically, evaluation systems for vocational education or CTE have not been geared to capture the full intent of an initiative such as Tech Prep that emphasizes higher-level academics and transition to college.

Changes Within Consortia. To fully understand the evolution of Tech Prep during the 1990s, it is helpful to know what has happened throughout the entire decade, including the last few years. Our prior research provided a detailed narrative about Tech Prep implementation up through 1998 or early 1999 in 8 selected consortia in the United States, and these results appear in Bragg et al. (1999). Presented herein are qualitative results of our most recent data collection since 1998-99 on curriculum reform, academic standards, articulation, and other essential elements, based on a systematic analysis of themes and patterns emerging across the 8 consortia engaged in this study.

Based on a thorough analysis of the data, we concluded that Tech Prep continued to focus largely on secondary curriculum reform during its initiation and early implementation in the 1990s, and a strong emphasis on secondary school reform continued to the present. Reasons for this include a perceived urgency to make significant changes within secondary schools before

Tech Prep reform moves to the postsecondary level. The predominant thinking seems to be that reform needs to occur within high schools to "raise the bar" for students who will eventually matriculate into college, usually community college. Theoretically, if Tech Prep programs are successful, they improve students' secondary preparation and outcomes, eventually allowing resources and attention to shift to the postsecondary level. Yet, after more than a decade of reform, resources have not shifted because the needs of secondary schools are a lasting priority.

A second conclusion drawn from our recent data collection is that Tech Prep programs have changed to address raised academic standards, including requiring more academic course-taking for all students, not only those aspiring to 4-year college. In fact, discussions about new academic standards, including raised high school graduation requirements, dominate the conversation in many consortia concerning educational reform and Tech Prep. State and local practitioners recognize that, for Tech Prep to be legitimate, it must deal seriously with academic standards. A consequence of this development is the emergence of College Tech Prep, representing a logical outgrowth of a dialogue about Tech Prep's contribution to academic reform. Consortia such as Golden Crescent and Guilford have aligned local definitions with state-level policies endorsing College Tech Prep as a recommended pathway for high school graduation and matriculation to college. In addition, these 2 consortia, along with Hillsborough, have pursued High Schools That Work (HSTW) as a means of integrating Tech Prep under a broader umbrella of high school reform. These consortia have used Tech Prep policies and funding to move their schools toward enhancing academic achievement for all students. Implementation of these kinds of reform is not easy because structural changes such as block scheduling are so difficult to initiate and sustain over time.

Articulated 2+2 curriculum (and other variations of 2+2), based on articulation agreements, has been a fundamental building block of local Tech Prep programs from the start, according to leaders of all 8 consortia. Consortium leaders continued to endorse articulation agreements as a bedrock of their programs, though the extent to which they were fully utilized by students or updated by faculty varied. In fact, most agreements associated with Tech Prep programs were initiated well before the mid-1990s, and their emphasis was mostly on articulation of CTE courses. However, changes occurring in the later 1990s, particularly since 1998 when new articulation agreements were forged to allow dual credit for CTE and academic course-taking, included articulation agreements associated with Tech Prep. Given their lengthy experience with articulation of CTE courses, it is noteworthy that advancements occurred in the area of articulation in all 8 consortia. Indeed, consortium leaders mentioned efforts to enhance articulation agreements, to implement more dual-credit or dual-enrollment courses, and spread information about these agreements to a far wider audience of educators, students, and parents.

Based on their recent experience with articulation, leaders of 2 of the consortia suggested that articulated- and dual-credit course-taking had begun to overshadow their consortia's more programmatic approach to handling articulation of Tech Prep. Specifically, academic course offerings for college credit overshadowed participation in CTE courses associated with Tech Prep programs (see, for example, the Mt. Hood case). These results suggest the importance of a careful review of strategies over time, along with local flexibility to modify and improve policies and practices to better reflect current needs. With respect to Tech Prep, a greater balance of

academic and CTE courses seems increasingly important to encourage Tech Prep participation, and to follow through on students' academic course-taking beginning at the secondary level. Dual-credit courses where students get college credit simultaneously with high school credit, without delay or exams, make transition to college a realistic goal for more students by making college credits readily accessible.

Looking further at the articulation element of Tech Prep under Perkins III, we observed that all consortia continued earlier efforts to establish more 2+2+2 curricular options. These initiatives were usually sought out in a few selected areas, rather than across the board. Though not consistent in all consortia, Tech Prep pathways were developed in such areas as allied health, business, and engineering technologies, where similar programs existed at the 2- and 4-year college levels. When developed, these articulated Tech Prep pathways offered students a viable route from high school to the Applied Associate of Science (AAS)-degree level, to an applied or standard Bachelor of Science (BS) degree. Articulation agreements involving public 4-year colleges were evident, but so were agreements with private colleges that were particularly aggressive at partnering with community colleges to capstone AAS-degree programs.

One other observation is worthy of mention with respect to articulation, and that is the emergence of new certifications as a mechanism for enhancing curriculum alignment and the awarding of college credits for coursework taken during high school. Particularly in the Information Technology (IT) area, several consortia were utilizing certification as proof that students had acquired competencies at the high-school level, and, were deserving of college credit. When students passed industry-sponsored certification tests, they not only held certificates making them eligible for employment, but they obtained a credential entitling them to college credits, ranging from a few hours to substantial credits (10–20 college credits), as in the case of a curriculum such as CISCO. In one consortium that we have seen struggle with articulation historically, consortium leaders viewed recent developments in aligning certifications with the college curriculum as a major breakthrough that could eventually result in significant expansion of articulation opportunities for students in the region.

Another concept that deserves discussion because of its emphasis on transition to college is the provision of student scholarships. Whereas several consortia offered some form of scholarships to entice students to enter community colleges, only a few made Tech Prep scholarships a prominent feature of their local Tech Prep initiative. (An important distinction is made here between scholarships awarded to youth apprenticeships to provide financial support via employer-sponsored tuition reimbursements, and related benefits.) Specifically, 3 consortia, Hillsborough, Miami Valley and Guilford, offered students scholarships to continue their postsecondary education in a Tech Prep program at the local community college. Interestingly enough, since their inception, scholarships have been under-subscribed in all 3 consortia, leaving a growing pool of resources to support student transition to college. However, 2 consortia had made concerted efforts to enhance their scholarship programs by increasing the monetary awards and lessening paperwork requirements, hoping to entice more students to matriculate to the postsecondary level. It is notable that in all three cases, it was the community college that was funding the scholarships and stepping up efforts to notify students of their availability, often with

strong advocacy from the community college president and support of the college's foundation office.

Other curriculum reform associated with Tech Prep was important, including changes involving updating, broadening, and integrating CTE curriculum within the broader secondary curriculum. Specifically, career clusters (referring to groupings of related occupations) and career pathways (extending specific clusters through career ladders linked to further education) were emphasized. These innovations were endorsed by consortium leaders to insure that secondary schools were preparing students for career opportunities requiring 2 or more years of postsecondary education. New career pathways evolved during this period, but many of these changes pre-dated Perkins III, and also the Building Linkages initiative of the OVAE/USDoe. Curricula associated with IT was particularly prominent, but so too was new curriculum dealing with various business programs and emerging technology areas such as integrated manufacturing and biomedical technology. Often, as was mentioned above, new certificates were associated with high-tech programs, making curriculum alignment across the secondary and postsecondary levels important, and also more possible.

A logical extension of the concept of career clusters is the notion of career academies, which is an emerging model of delivery of Tech Prep (see, for example, Hull, 2000; Pierce, 2001). Within the selected consortia studied, it is noteworthy that there was a growing commitment to either initiate new career academies or enhance existing ones. Varying widely in approach and structure, leaders of each consortia displayed a positive attitude toward the career academy concept, and enthusiasm was evident in secondary administrators and teachers implementing them. At the postsecondary level, we observed a companion idea to career academies, and that was learning communities. Though not always linked directly to Tech Prep, some consortium leaders recognized the parallels between secondary career academies and postsecondary learning communities, and they desired opportunities to connect these strategies. Hillsborough provides a good example of how the adoption of learning communities evolved separately from Tech Prep, but linkages emerged as ideas spread over time on the college campus.

Expansion of work-based learning (WBL) was evident in several consortia, representing a new foci of Perkins III. Possibly because of the decline in visible emphasis of School-to-Work (STW), Tech Prep was increasingly viewed as a means of encouraging more students to engage in WBL. Interestingly, whereas youth apprenticeships continued to grow in the Guilford consortium as a primary form of WBL, the youth apprenticeship program in East Central appeared to drift when local leadership left the area. A softening economy coupled with the turnover of local education and business leaders who had championed Tech Prep weakened commitment to youth apprenticeships in the East Central consortium. Even so, in that consortium, other forms of WBL were enhanced, such as job shadowing and co-op, and we observed a growth in these forms of WBL in other consortia, as well. In consortia such as East Central, the commitment to WBL included the claim that every student would participate in job shadowing at some point during high school.

Yet another area addressed centrally in the new Perkins III legislation is evaluation, accountability, and outcomes assessment associated with Tech Prep participation. Given the heightened emphasis of Perkins III on accountability, the uneven emphasis on evaluation across the selected Tech Prep consortia is worth mentioning. Consistently across the consortia visited, we heard comments of frustration about the lack of consensus about Tech Prep definitions for student participation at both the secondary and postsecondary levels. Though most of these consortia started with more advanced evaluation systems than exist for typical Tech Prep consortia (Bragg et al., 1999; Hershey et al., 1998), substantial progress was made in sites such as East Central and Golden Crescent, where more attention was placed on establishing reliable definitions and enhancing outcomes assessment and student tracking (follow-up) systems in conjunction with heightened state-level evaluation activities.

Other changes were evident in individual consortia, and they are described earlier in this report since this section deals mainly with cross-consortium results. Whereas other essential elements, such as teacher and counselor professional development, equal access, and preparatory services, continue in each consortium, our discussion has focused on changes that were most pervasive and striking during the past 2 or 3 years after Perkins III was passed.

Contributors to Change

Characteristics of Change. Fullan (2001) describes the characteristics of change as those factors having to do with need, clarity, complexity, and quality/practicality. With respect to Tech Prep, widespread support has been expressed for educational changes targeted by the Tech Prep reform, especially at the secondary level. Beginning in the 1980s, educational leaders such as Dale Parnell (1985) and commissions such as the William T. Grant Foundation (1988) recognized that students were being left out of plans for enhanced schooling. Changes in the economy since that time require a more highly skilled workforce, fueling the need for a better-educated populace with postsecondary education for the majority of America's students (Secretary's Commission on Achieving Necessary Skills, 1991). New academic standards and higher graduation requirements across the nation demand that the majority of students achieve higher academic competencies, which is consistent with the goals of Tech Prep. Coupling these forces with recent reports on the ineffectiveness of high school education, particularly during the senior year (National Commission on the High School Senior Year, 2001), it seems apparent that reform ideas such as those associated with Tech Prep are needed, providing the impetus to address fundamental concerns about education today.

Even so, the determination of whether a reform is successful or not involves more than need alone. Clarity, complexity, and practicality are important indicators, too, and questions continue to revolve around these characteristics. Indeed, questions have been raised from the beginning about key definitions of what a Tech Prep program entails and who the Tech Prep student is. Difficulties in identifying and serving a specific target population such as the forgotten half or neglected majority (i.e., the middle 2 quartiles of students based on standard academic measures) have been observed since Perkins II was passed in 1990. Even when these groups are viewed as in dire need of attention, reforms targeting these students are labeled as tracking students into a "lesser-than" form of education. Indeed, charges that Tech Prep is another, newer form of

tracking have been pervasive, whether tracking takes the form of general education, vocational education, or a hybrid of the two. Understanding the negative stigma of tracking, some teachers, parents, and students have steered away from Tech Prep, with some declining to participate altogether. Responding to this criticism, Tech Prep consortia have expanded their policies to be inclusive of diverse student groups, sometimes calling for *all students* to participate. Reinforcing this point, language associated with the target audience for Tech Prep changed to avoid association with tracking in all 8 consortia. This is especially important to consortia located in urban and demographically diverse regions where concerns about inequities in educational access and opportunities have existed for years.

Beyond concerns associated with student populations for Tech Prep, there are pervasive issues surrounding the creation and sustenance of articulation agreements, and alternative curriculum and instruction central to the Tech Prep concept. Over time, local consortia have made changes in Tech Prep curriculum to accommodate the goals and structure of the existing educational system, such as replacing applied academics courses with contextual teaching in existing academic courses. Also over time, older forms of articulation have been replaced by dual enrollment and dual-credit arrangements that expedite college credit. Further, youth apprenticeships have been modified or changed so that less-intensive WBL models such as a job shadowing and co-op are adopted. Recognizing these accommodations is important because they suggest that initial implementation strategies were not workable, given the existing system. The extent to which consortia across the nation have changed their fundamental approach to Tech Prep is unknown, but the variability in approaches utilized by 8 consortia engaged in our study suggest some are likely to have changed, while others have not. Of course, the effectiveness of either older or newer forms of Tech Prep is unknown on a wide scale, so it is impossible to know whether the changes have been problematic or prophetic of future success.

Local Characteristics. The extent to which a reform such as Tech Prep has taken root is undeniably linked to local context, the fundamental nature of people, and the ways in which local educational institutions, businesses, and community groups operate. Because Tech Prep is guided by essential elements and the structure of a local consortium arrangement, there is a great deal of flexibility in local implementation and the resultant models that emerge. Fullan (2001) identifies local characteristics as those factors dealing with the district, the community, principals, and teachers. In a reform as comprehensive and complex as Tech Prep, other local entities come into play, such as the Tech Prep consortium, the postsecondary institutions, business and industry, and other community groups. Within schools and colleges, many more educational leaders play a role in Tech Prep besides building principals. And teachers are not alone in their involvement in Tech Prep, because counselors and other support staff often play an integral role in a local Tech Prep initiative. Referring again to the characteristics of change mentioned earlier, this very lengthy list of stakeholders makes the high level of complexity of Tech Prep implementation quite clear. Any time innovation hinges on the direct involvement and support of so many, barriers due to inevitable and important differences need to be addressed.

Curricular changes associated with Tech Prep are not subtle; they require the total and undivided attention of leaders who are committed to seeing that implementation is conducted in a concerted way. Skillful leadership is needed to coordinate and execute Tech Prep reform, and this has been especially true in communities where Tech Prep has been perceived as antithetical to academic reform, due partly to the historic split between academic education and vocational education (Little, 1996). Recognizing this dilemma, capable and committed leaders in the 8 consortia dedicated their actions to Tech Prep implementation, and they gained support from influential and competent leaders in schools, colleges, and businesses in their communities. There is no question that strong consortium leadership is critical to making structural changes such as block scheduling, which is enormously difficult to implement but, when achieved, carries numerous positive attributes. Similarly, professional development, which is a legislated element and integral component of Tech Prep since the early years, can play a vital role in engaging administrators, faculty and other personnel in orientation and training about Tech Prep.

In several consortia, inconsistency in local leadership contributed to difficulties with implementation of Tech Prep. Turnover of the local consortia leaders and of high schools and community colleges played havoc with implementation, especially when these people were replaced with persons lacking an understanding and commitment to Tech Prep reform ideas. Even when new leaders showed strong commitment to Tech Prep, a significant change in direction was evidenced for some local initiatives (e.g., East Central). In other sites where consortium leadership changed over time, as occurred in Miami Valley, Golden Crescent, Mt. Hood, and San Mateo, loss of momentum and confusion occurred as relationships formed around new people and ideas. But in the end, some consortia appeared to be strengthened with new leadership, suggesting changes in leadership need not result in diminished capacity or quality. Even so, when dedicated leaders steered the course from the start, as happened in Hillsborough, Metro, and Guilford, benefits accrued to the region, due in large part to the local consortium leaders' deep knowledge of the educational system and fervor for reforming it.

Regardless of the commitment and competence of local leaders, the fiscal resources for local consortia to implement changes are limited. Consistently we heard complaints about lacking resources to accomplish laudable goals particularly objectives associated with secondary education. Indeed, we heard constituents of all types (administrators, teachers, business representatives, parents) point out the fact that too few resources were being dedicated to Tech Prep and that the serious problems of high schools could not be overcome by the limited resources associated with Tech Prep. Even when Tech Prep monies were supplemented with state, local, or grant funding, few consortia had sufficient funds to make needed changes in secondary education, let alone attempt to reform collegiate-level curriculum and instruction.

Finally, with respect to local characteristics, we learned that communication between the secondary and postsecondary levels, and between schools and external groups such as business and state agencies (mentioned below), was instrumental to successful implementation. In 4 consortia where interpersonal and mediated communication was used quite effectively, sustained growth was observed in curriculum offerings, student enrollments, and undoubtedly student outcomes (for further discussion of student outcomes see Bragg et al., in press). Continued expansion of articulation agreements could be traced to deliberate commitments to on-going

communication of key personnel at the secondary and postsecondary levels. Conversations about curriculum alignment and integration of academic and career-technical education were facilitated by sustained dialogues among faculty on both levels, thereby enhancing students' opportunities for enhanced transition to college. Also noteworthy among the most advanced articulation sites was the development of information management systems (IMS) to document articulated- and dual-credit course enrollments. Where this was occurring, the community college in each consortium was leading the way, often dedicating its own resources and personnel to the effort.

External Factors. When Fullan (2001) wrote about educational change, he mentioned a small set of external factors, pointing mostly to government and other agencies. Clearly, he did not have in mind such a comprehensive reform at Tech Prep, which takes into account not only educational entities, but also external groups such as businesses, industrial firms, and other community groups. Without question, how active states have been in implementation of Tech Prep depends on the states and their historic role in oversight of vocational education, which is typically where state-level leadership resides for the Tech Prep reform. Leaders of consortia residing in states such as Florida, Texas, Ohio, New York, and North Carolina mentioned the role of state agencies frequently during our visits, whereas local personnel in consortia in Illinois, Oregon, and California attributed less influence to state agencies. Where the state role was more prevalent, there was an apparent emphasis on policy formulation, consistency in definitions and practice, and program improvement over time. In other states, such as Illinois, Oregon, and California, where we heard less about the state role, we sensed state agencies were playing more of a low-key role except in mandated areas, such as evaluation and accountability. Regardless, it is important to note that at least a few persons associated with each consortium complained about a lack of consistency in intended goals and definitions for Tech Prep, while also criticizing state agencies for too much oversight, paperwork, and unnecessary interference.

Looking beyond fiscal and administrative difficulties internal to the system, we see that other constituents play an ameliorative role in implementation of Tech Prep. For example, in most consortia, local business and industry plays a highly supportive role in encouraging Tech Prep implementation and advocating for raised academic standards and higher technical skills among high school graduates and college students. This action was particularly evident in consortia such as East Central, Mt. Hood, and Guilford where business and industry has played an integral role in governance and curriculum development historically. In states where these consortia are located, state-level policies dealing with academic reform are continually evolving, so knowing where to anchor academic achievement is not always clear. In the Mt. Hood partnership, for example, influential businesses have leveraged local resources to create the Center for Advanced Learning (CAL), which is dedicated to providing Tech Prep-related learning experiences for all students who choose to apply. Business and industry has been key to the start-up of this initiative, contributing time, talent, and resources. Throughout the design phase, business representatives have emphasized enhanced academic and career-technical education for all students who attend CAL, providing a focal point that education leaders could use to help the educational community reach consensus and maintain momentum. In the East Central, Guilford, and a few other sites, we observed similar benefits when local business and community groups became involved, noting the powerful leverage these external groups could provide to steer the reform over time.

Recommendations for Future Policy and Practice

Based on careful assessment of each local consortium, we offer 10 recommendations that may be meaningful to other Tech Prep consortia in the United States:

1. Encourage the development of local and state policies that promote articulation agreements supporting transition from high school to college for more students. All 8 consortia were moving toward dual-enrollment or dual-credit models, which were easing the college credit dilemma associated with CTE course-taking and Tech Prep. Consortia in states such as Texas were benefiting from statewide articulation efforts that seemed to stimulate positive advancements in the creation of new career pathways extending from the secondary to the postsecondary level.
2. Recognize that consortia across the United States have increasingly diverse student populations. It is increasingly important for local leaders to maintain an eye on the growing diversity of their students and ways to implement Tech Prep programs that enhance educational access and opportunity. Given the increased diversity of U.S. society, assurances that all students have equal access and educational opportunity to participate in pathways that lead to college and achieve valued outcomes at the postsecondary level are vitally important.
3. Continue to associate Tech Prep with raised academic standards at the secondary and postsecondary levels, as well as enhanced career opportunities, including employment in professional and technical occupations beyond the 2-year degree. Ensure that all students who participate in Tech Prep have viable opportunities to further their education and advance in careers that provide viable wages, economic security, and social mobility.
4. Avoid conceptualizations of Tech Prep that involve tracking or the culling out of groups of students possessing particular academic abilities or other personal traits. Rather, utilize Tech Prep to experiment with new curricular reforms, including exploring and systematically evaluating options such as College Tech Prep and career academies. In so doing, ensure that all students have knowledge of and means for participating in these new programs.
5. Enhance funding for Tech Prep at both the secondary and postsecondary levels, and utilize these funds to explore innovative curricular and instructional options that serve an increasingly diverse student population. Recognize that any reform needs to be carefully planned, and that changes should not be so complex or comprehensive as to outstrip the capabilities of local personnel to implement them. As Fullan (2001) pointed out, clarity, simplicity and practicality are vital to the success of almost any educational reform.

6. Encourage partnerships with business, industry, labor, and community groups that encourage a sustainable approach to Tech Prep, emphasizing advanced academic and career-technical education sensitive to academic reforms, larger economic changes, and local market forces over time. Continue to explore ways that business and industry can contribute to participatory forms of governance, curriculum reform, and professional development opportunities for faculty and other key constituents. Remember that successful business-education partnerships can play a highly beneficial role, but the perspective of business and industry should not dictate the future. A balance of perspectives held by education and business is needed for the long term.
7. Strengthen the role of community colleges by recognizing and building upon the contributions that successful Tech Prep consortia have created for their postsecondary partners. Recognize and utilize the assets postsecondary institutions bring to the local Tech Prep reform effort, including the ability to award college credit for high-school level academic and CTE courses, expertise in evaluation and assessment, and extensive networking with businesses and community organizations that is needed to link K-12 education to issues and concerns of the community.
8. Involve 4-year colleges and universities in Tech Prep curriculum reform from the beginning, not as an afterthought. Some concerns about tracking may be relieved if curriculum (career) pathways are created that provide students with opportunities to matriculate from high school to baccalaureate-degree programs, encouraging 2+2+2 transition opportunities for more students. To reinforce this activity, identify model 2+2+2 curricula, and experiment with ways to institutionalize these ideas, encouraging on-going communication among educators to sustain the changes and enhanced information sharing with students and parents to encourage and support their involvement.
9. Continue to utilize reform concepts affiliated with Tech Prep to reform all of CTE, but do not confuse Tech Prep with general CTE initiatives that have existed in secondary schools for years. Abandoning Tech Prep now, after nearly a decade of deliberate change at the local level, and integrating it back into the general CTE approach, would threaten advancements that have been made in the 1990s particularly the commitment to advanced academic coursework and to postsecondary transition.
10. Enhance program evaluation and outcomes assessment approaches to insure that Tech Prep programs continue to advance and improve. Avoid approaches to evaluation that focus entirely on counting enrollments, in favor of innovative assessment strategies that provide in-depth knowledge of what students are learning and how they are benefiting.

To conclude, after over a decade, the 8 selected consortia engaged in this study remain committed to fundamental ideas associated with Tech Prep, and they should be commended for their sustained, dedicated efforts. These 8 consortia strive to educate many students who would not garner much attention in high school, particularly students who struggle with traditional academics. They also seek out innovative curriculum and instructional approaches that are thought to benefit all learners, and they encourage business and industry involvement to enhance

students' acquisition of academic, technical, and employability skills. And, they aggressively pursue work-based learning and employment opportunities that begin program graduates at a living wage, and offer career advancement over time. Moreover, leaders of these 8 consortia create opportunities that support student transitions, helping them jump-start college. Undoubtedly, a reform as complex as this one has barriers, but consortium leaders offered creative solutions. They are, indeed, reformers who have persevered in their efforts to improve education.

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